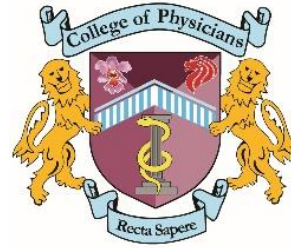




**ACADEMY OF MEDICINE  
SINGAPORE**



**CHAPTER OF RENAL PHYSICIANS  
COLLEGE OF PHYSICIANS, SINGAPORE**

# **INTERVENTIONAL NEPHROLOGY CREDENTIALING GUIDELINE**

## **RENAL MEDICINE**

**13 JANUARY 2023**

*Developed by*

**CHAPTER OF RENAL PHYSICIANS  
COLLEGE OF PHYSICIANS, SINGAPORE**

## 1. History of Nephrology Practice

The practice of nephrology has been closely associated with the need to perform procedures since its inception as a subspecialty in medicine in 1950s (1). In the beginning, the ability to perform and interpret renal biopsy from a living patient with kidney disease was a requirement to be a renal physician (2). The job scope of the nephrologist subsequently expanded to include performing hemodialysis and peritoneal dialysis with the discovery of kidney replacement therapies to treat patients with end stage kidney failure (ESKF) (3).

In the early days of hemodialysis therapy, needles were surgically inserted into the artery and vein during each treatment and the ability to continue treatment was limited by the availability of blood vessels as they were destroyed after each session (4). In 1960, Scribner and Quinton designed the Scribner shunt to be placed between an artery and vein to allow repeated hemodialysis treatment without destroying the blood vessels (5). Nephrologists were then involved in the insertion of acute shunts and thrombectomy when the shunts were blocked (6). This practice continued till a better and more durable way of accessing blood vessels for hemodialysis using an arteriovenous fistula was described in 1966(7). In peritoneal dialysis therapy, Henry Tenckhoff, a nephrologist, would visit patients with ESKF on weekends to insert acute peritoneal dialysis catheters for peritoneal dialysis before he invented the Tenckhoff catheter for chronic usage (8, 9).

The successful creation of arteriovenous fistula in 1966 (10) and arteriovenous graft in 1972 (11) for hemodialysis treatment was revolutionary as they allowed patients to receive long-term dialysis using a permanent vascular structure. Similarly, the use of Tenckhoff catheter for chronic peritoneal dialysis changed the practice of nephrology by allowing daily peritoneal dialysis via a permanent tube (12). In the 1970s and 1980s, there was decreased interest in vascular access management among nephrologists because other areas of nephrology seemed scientifically more rewarding (13). Creation of access for hemodialysis and peritoneal dialysis were mainly done by surgeon except in a handful of countries (14). Following the description of percutaneous transluminal angioplasty for salvaging of hemodialysis access in 1980s, radiologists became involved in the maintenance and salvage of hemodialysis access (15, 16). The care of ESKD patients on renal replacement therapies became more complex with the need to coordinate care between different subspecialties, and nephrologists may not have the necessary procedural skillsets or knowledge to handle access-related issues (17). Adding to the problem was the ever-increasing dialysis patient population which created a demand for access to care in both hemodialysis and peritoneal dialysis patients (18). In the era of modern nephrology, the care of dialysis access became more complex and fragmented, involving multiple specialties such as radiologists, vascular surgeons and urologist at only specific care points. Moreover, dialysis access related issues have become a significant cause of

morbidity and mortality in patients with ESKF, accounting for almost 25% of all hospital stays and contributing to as much as 50% of all hospitalization cost (19-21).

## 2. History of Interventional Nephrology

In 2000, the American Society of Diagnostic and Interventional Nephrology (ASDIN) was established to promote the skillful performance of procedures by nephrologists that would lead to substantial improvements in the care of patients in the United States(22). Consequently, formal training program in ultrasonography and dialysis access interventions were introduced with practice standards and accreditation processes established, allowing the certification of physicians in procedures and heralding the start of interventional nephrology as an important subspecialty.

## 3. Interventional Nephrology in Singapore

In Singapore, given the high prevalence of dialysis patients, the need for our nephrologists to be trained to handle dialysis access related complications in hemodialysis and peritoneal dialysis patients became pressing. Since 2000, a total of nine nephrologists were awarded the Human Manpower Development Program (HMDP) to train in the field of interventional nephrology. Local nephrologists also underwent overseas attachment on their own funding to acquire the necessary skills and training. In addition, trained interventional nephrologists from the United States and United Kingdom joined our local nephrology fraternity to further lend capability in the subspecialty. Today, almost all the public healthcare institutions in Singapore have at least one nephrologist trained in interventional nephrology. There is also a local HMDP fellowship available for training in interventional nephrology.

Recognizing the need for standardization of training and credentialing locally for interventional nephrology, the Chapter of Renal Physicians under the Academy of Medicine Singapore formed a workgroup in 2021 to harmonize and propose the credentialing criteria for nephrologists to perform such procedures in Singapore. Composition of the workgroup is shown in the acknowledgement table. It included interventional and non-interventional nephrologists from both public and private healthcare institutions. The performance of renal biopsy and non-tunneled hemodialysis catheter, is already a requirement for graduation from the nephrology senior residency program in Singapore. Hence, the workgroup's focus was on the performance of tunneled hemodialysis catheter insertion, endovascular procedures and peritoneal catheter insertion as these skills are acquired after graduation from nephrology training.

The ASDIN credentialing criteria for the procedures is adopted to meet our local context and needs. The training standard guidelines for diagnostic radiologists performing percutaneous

peripheral angioplasty published by the Academy of Medicine, Singapore in 2001 was also reviewed to ensure consistency in standards across different disciplines.

Additionally, the workgroup reviewed different credentialing standards for the procedures performed in public health institutions (PHIs).

Beside fulfilling the interventional nephrology core curriculum published by the ASDIN and showing mastery in various aspects of interventional nephrology, interventional nephrologists need to demonstrate clinical competency in the performance of the procedures. Hence, the focus of this guideline is to outline the procedural requirement that an interventional nephrologist need to perform as a primary operator to meet the credentialing criteria in Singapore. These procedural requirements are shown in table 1 and can be completed during HMDP or locally

	<b>Procedures</b>	<b>Credentialing criteria<sup>1</sup>:</b>	<b>Maintenance of credentialing<sup>2</sup></b>
1.	Insertion of tunneled hemodialysis catheter	Complete 25 de novo tunneled long term hemodialysis catheters	Perform five procedures within a 2-year period
2.	Endovascular intervention for hemodialysis access		
	(a)Angiography	Complete 25 angiographic procedures to examine hemodialysis vascular access (includes both AVF and AVG)	Perform 5 angiography and angioplasty procedures within a 2-year period
	(b)Angioplasty	Complete 25 angioplasty procedure (includes both AVF and AVG)	
	(c)Thrombolysis	Complete 25 thrombolysis and thrombectomy procedure (includes both AVF and AVG)	
	(d)Endovascular stenting	Complete the placement of endovascular stents in 5 patients	

3.	Peritoneal catheter insertion		
	(a)Percutaneous technique with/without fluoroscopy guidance	Perform a minimal of 10 insertion procedures	Perform 5 insertion within a 2-year period
	(b)Peritoneoscopic technique	Perform a minimal of 10 insertion procedures	
	(c)Open surgical technique	Perform a minimal of 30 insertion procedures under supervision and additional 20 as an independent operator	Perform 20 insertion within a 2-year period

**Table 1: Credentialing criteria for interventional procedures performed by nephrologist in Singapore**

<sup>1</sup>The proceduralist should complete the following procedures under the supervision of a qualified interventionalist who can be either an interventional nephrologist, interventional radiologists or surgeon.

<sup>2</sup>over a 2-year period after successful credentialing

For tunneled hemodialysis catheter, the proceduralist seeking credentialing would need to complete at least 25 insertions of tunneled hemodialysis catheter independently under fluoroscopy guidance as the primary operator, supervised by a qualified interventionalist. This criterion is similar to that set by the ASDIN. Similarly, for endovascular intervention, the proceduralist seeking credentialing would need to perform 25 angiographies, 25 angioplasties, 25 thrombolysis and 5 stenting procedures independently under supervision. The maintenance of credentialing was set up to ensure that the proceduralists remain active and continue to participate in the performance of procedures after obtaining their accreditation privileges.

For the insertion of peritoneal dialysis catheter, to reflect the complexity of open technique over percutaneous and peritoneoscopic techniques, the number of procedures needed for the proceduralist seeking credentialing for the open technique will be higher and in accordance with existing criteria in PHI.

In addition to fulfilling the minimal number of procedures, the outcome of the procedures performed should also be considered and a procedure log with information on the dates and type of procedures performed, outcomes (including complications, if any) and name of supervisor should be maintained. Notwithstanding the minimal standards, the proceduralist would be subjected to the credentialing and privileging framework within the healthcare institutions that they are practicing in and the performance of these procedures may be subjected to any other condition. In addition, as the use of fluoroscopy equipment is common

in the practice of interventional nephrology, a good knowledge and practice of radiation safety are also important aspects of patient care. Proceduralist should also be registered as radiation workers as per regulatory requirement where applicable.

#### 4. Conclusion

In conclusion, a good knowledge of access management in hemodialysis and peritoneal dialysis patients is important in improving their care and outcome. The performance of interventional procedures by nephrologist should be held to the same standards as our surgical and radiological colleagues. These credentialing guidelines will serve as a guide and reference for nephrologists keen to pursue interventional nephrology in Singapore. The success of interventional nephrology will help improve dialysis patients' care in Singapore.

**REFERENCES**

1. Robinson RR, Richet G. International Society of Nephrology: a forty year history. 1960-2000. *Kidney international Supplement*. 2001;79:S1-100.
2. Pollack HM, Goldberg BB, Kellerman E. Ultrasonically guided renal biopsy. *Arch Intern Med*. 1978;138(3):355-6.
3. Cameron JS, Hicks J. The introduction of renal biopsy into nephrology from 1901 to 1961: a paradigm of the forming of nephrology by technology. *American journal of nephrology*. 1997;17(3-4):347-58.
4. Konner K. History of vascular access for haemodialysis. *Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association*. 2005;20(12):2629-35.
5. Quinton W, Dillard D, Scribner BH. Cannulation of blood vessels for prolonged hemodialysis. *Trans Am Soc Artif Intern Organs*. 1960;6:104-13.
6. Lundberg M, Erlanson P, Larsson R. Quinton-Scribner arteriovenous shunts for hemodialysis. A review of 6.5 years' experience. *Scand J Urol Nephrol*. 1977;11(1):47-51.
7. Lockridge JB, Chandran S. The Scribner shunt: 50 years later. *Kidney Int*. 2012;81(1):120.
8. Tenckhoff H, Shilipetar G, Boen ST. One Year's Experience with Home Peritoneal Dialysis. *Trans Am Soc Artif Intern Organs*. 1965;11:11-7.
9. McBride P. Henry Tenckhoff: The father of Chronic Peritoneal Dialysis. *Peritoneal Dialysis International: JOURNAL of the International Society for Peritoneal Dialysis*. 1983;3(1):47-51.
10. Brescia MJ, Cimino JE, Appel K, Hurwich BJ. Chronic hemodialysis using venipuncture and a surgically created arteriovenous fistula. *The New England journal of medicine*. 1966;275(20):1089-92.
11. Chinitz JL, Tokoyama T, Bower R, Swartz C. Self-sealing prosthesis for arteriovenous fistula in man. *Trans Am Soc Artif Intern Organs*. 1972;18(0):452-7.
12. Tenckhoff H, Schechter H. A bacteriologically safe peritoneal access device. *Trans Am Soc Artif Intern Organs*. 1968;14:181-7.
13. Saad TF. Interventional Nephrology for Hemodialysis Vascular Access: Insight about an Evolving Branch. *Saudi J Kidney Dis Transpl*. 2004;15(3):239-50.

14. Konner K, Nonnast-Daniel B, Ritz E. The arteriovenous fistula. *J Am Soc Nephrol.* 2003;14(6):1669-80.
15. Glanz S, Gordon D, Butt KM, Hong J, Adamson R, Sclafani SJ. Dialysis access fistulas: treatment of stenoses by transluminal angioplasty. *Radiology.* 1984;152(3):637-42.
16. Hunter DW, Castaneda-Zuniga WR, Coleman CC, Young AT, Salomonowitz E, Mercado S, et al. Failing arteriovenous dialysis fistulas: evaluation and treatment. *Radiology.* 1984;152(3):631-5.
17. Beathard GA. Interventional nephrology: a part of the solution. *Semin Dial.* 2006;19(2):171.
18. Thurlow JS, Joshi M, Yan G, Norris KC, Agodoa LY, Yuan CM, et al. Global Epidemiology of End-Stage Kidney Disease and Disparities in Kidney Replacement Therapy. *American journal of nephrology.* 2021;52(2):98-107.
19. Feldman HI, Held PJ, Hutchinson JT, Stoiber E, Hartigan MF, Berlin JA. Hemodialysis vascular access morbidity in the United States. *Kidney Int.* 1993;43(5):1091-6.
20. Oliver MJ, Al-Jaishi AA, Dixon SN, Perl J, Jain AK, Lavoie SD, et al. Hospitalization Rates for Patients on Assisted Peritoneal Dialysis Compared with In-Center Hemodialysis. *Clinical journal of the American Society of Nephrology : CJASN.* 2016;11(9):1606-14.
21. Carlson DM, Duncan DA, Naessens JM, Johnson WJ. Hospitalization in dialysis patients. *Mayo Clin Proc.* 1984;59(11):769-75.
22. O'Neill WC. Seminars in nephrology. Introduction. *Semin Nephrol.* 2002;22(3):181-2.

## ACKNOWLEDGEMENT

Co-Authors	
(1) Clin A/Prof Tan Chieh Suai	Head & Senior Consultant Department of Renal Medicine Singapore General Hospital
(2) Dr Adrian Liew Seng Teck	Senior Consultant Nephrologist and Director The Kidney & Transplant Practice



<b>(3) Dr Christopher Leo Cheang Han</b>	Clinical Director Nephrology and Dialysis Services Raffles Medical Group
<b>(4) Dr Tan Ru Yu</b>	Senior Consultant Department of Renal Medicine Singapore General Hospital
<b>(5) Dr Sreekanth Koduri</b>	Chief & Senior Consultant Department of Renal Medicine Changi General Hospital
<b>(6) Dr Shashidhar Baikunje</b>	Head & Senior Consultant Department of Renal Medicine Sengkang General Hospital
<b>(7) Dr Sabrina Haroon Wong</b>	Senior Consultant Division of Nephrology, Department of Medicine National University Hospital
<b>(8) Dr Low Sanmay</b>	Consultant Division of Renal Medicine, Department of Medicine Ng Teng Fong General Hospital
<b>(9) Dr Lim Eng Kuang</b>	Senior Consultant Department of Renal Medicine Khoo Teck Puat Hospital
<b>(10) Dr Yeo See Cheng</b>	Head & Senior Consultant Department of Renal Medicine Tan Tock Seng Hospital
<b>(11) Dr Behram Ali Khan</b>	Director Allied Health Services & Medical Services National Kidney Foundation
<b>(12) Dr Ng Tsun Gun</b>	Nephrologist T G Ng Kidney & Medical Centre

**PUBLISHED: 13 JANUARY 2023**

Chapter of Renal Physicians  
College of Physicians, Singapore  
Academy of Medicine, Singapore  
81 Kim Keat Road  
#11-00 NKF Centre  
Singapore 328836