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Complex Vascular Anomalies – Optimising Outcomes with Multidisciplinary Management

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While certain small vascular tumours and malformations can be well-managed in the primary care setting, more complex and severe cases would greatly benefit from a multidisciplinary specialty care approach. Read more about how the vascular anomalies teams at the SingHealth Duke-NUS Vascular Centre can help to manage these patients, utilising multimodal treatment for optimal outcomes.

INTRODUCTION

Vascular anomalies are a heterogeneous group of conditions that involve abnormal growth or arrangement of various forms of blood or lymphatic vessels in the body. They can range from mild to severe conditions that can lead to significant physical, psychological and emotional impairment.

Small infantile haemangiomas or capillary malformations, especially those not on critical sites (e.g., arms, legs and trunk) can be managed in the primary care setting.

However, more complex and severe vascular anomalies should ideally be managed under the care of a multidisciplinary team in centres specialising in their management. A combination of various treatments involving input from various sub-specialties may be required for optimal results.

MULTIDISCIPLINARY MANAGEMENT OF COMPLICATED VASCULAR ANOMALIES FOR BETTER OUTCOMES

Complex and complicated vascular anomalies require multimodal and multidisciplinary management to optimise outcomes.

Typical treatment modalities include:

- Systemic medications
- Interventional radiological procedures (e.g., sclerotherapy and embolisation)
- Surgery
- Lasers
- Physical therapy

The multidisciplinary vascular anomalies teams at KK Women's and Children's Hospital (KKH) and Singapore General Hospital (SGH) are part of the SingHealth Duke-NUS Vascular Centre (SDVC), and provide a one-stop centre for the diagnosis and management of a wide range of vascular anomalies in adults (seen at SGH) and children and adolescents (seen at KKH).



CASE STUDY

The Multidisciplinary Management of a Young Woman with Extensive Venous Malformations

Initial presentation and history

Patient M presented to the Vascular Anomalies Clinic at KKH with extensive venous malformations of her lip, tongue and buccal mucosa (*Figure 1A*). These were present at birth and had gradually increased in size over the years. Imaging revealed deeper involvement including the pharynx and larynx, with narrowing of her upper airways.

While the patient had previously sought advice from other healthcare providers, no single treatment had been deemed effective and safe due to the extent of airway involvement.

A multidisciplinary management plan

With discussion amongst the members of the multidisciplinary vascular anomalies team at KKH, a targeted and holistic management plan was put in place for the patient.

This involved multimodal treatment with **oral sirolimus**, multiple treatment sessions for **sclerotherapy**, and **pulsed dye laser (PDL) and neodymium-doped yttrium aluminium garnet (Nd:YAG) laser treatment** over two to three years. She was under continued review by the multidisciplinary teams at both KKH and SGH.

Patient outcomes

Post-treatment, there was marked improvement in the size of the venous malformations, both externally and internally (*Figure 1B*). The patient and her family were happy with the results, and she is now a more confident young woman. M continues to be reviewed by her multidisciplinary care team.

The teams comprise experts in the fields of:

- Dermatology
- Interventional radiology
- Haematology/oncology
- Plastic and reconstructive surgery
- Paediatric surgery
- Vascular surgery
- Orthopaedic surgery
- Genetics
- Gastroenterology
- Respiratory
- Ophthalmology
- Otolaryngology
- Physiotherapy
- Occupational therapy
- Speech and language therapy
- Psychology



Figure 1
Venous malformations affecting the tongue, lip and larynx, before (A) and after (B) multimodal treatment

CLASSIFICATION OF VASCULAR ANOMALIES

According to the International Society for the Study of Vascular Anomalies (ISSVA), vascular anomalies can be classified into two broad categories – vascular tumours and vascular malformations (Figure 2). This classification has led to standardisation of

the nomenclature. This is important as there now exists a variety of treatment options targeted at the various vascular tumours and malformations. Accurate diagnosis is key for appropriate treatments and optimal outcomes.

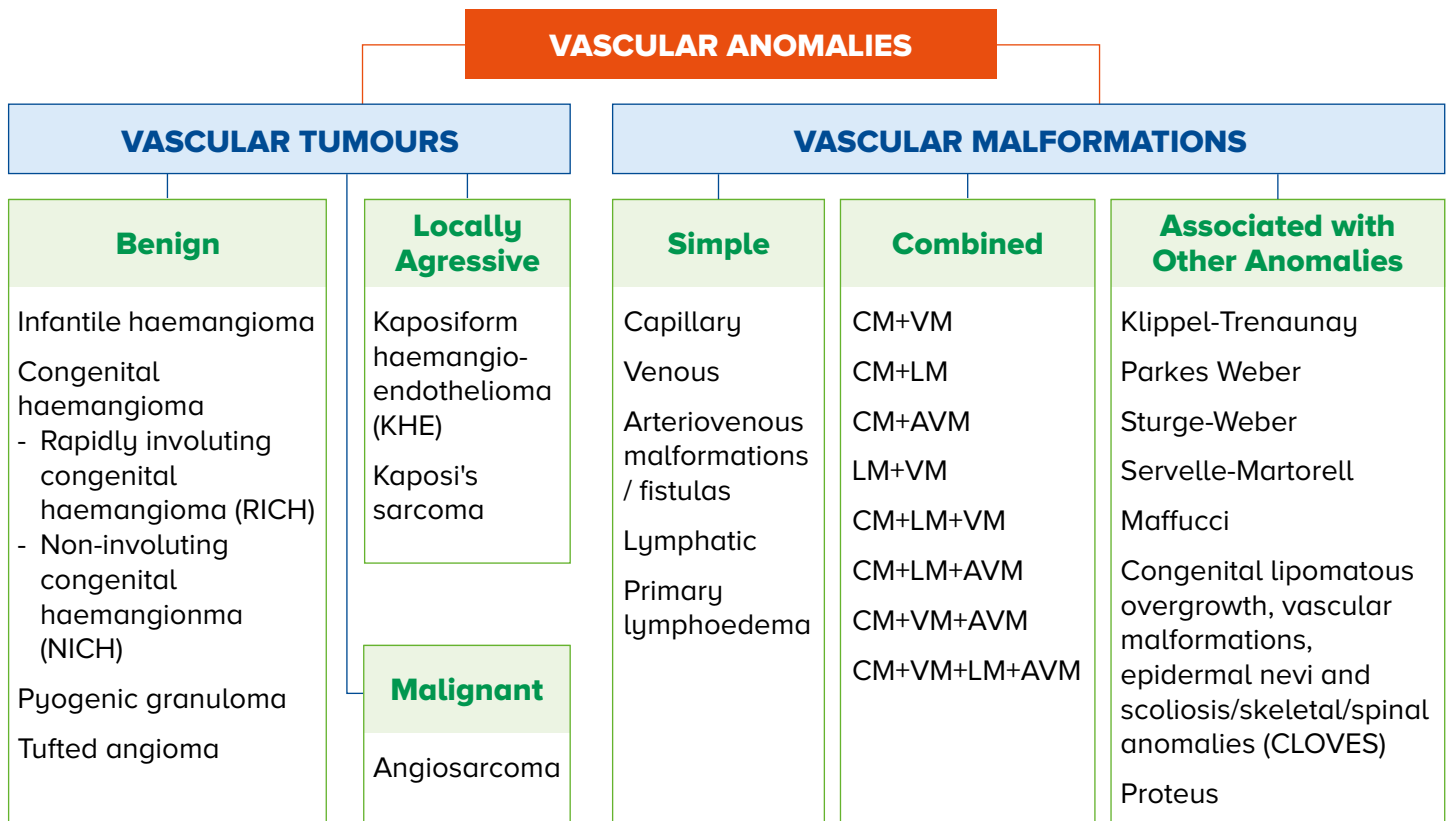


Figure 2 ISSVA Classification of Vascular Anomalies 2018 (abridged)

CM: capillary malformation, VM: venous malformation, LM: lymphatic malformation, AVM: arteriovenous malformation

TYPES OF VASCULAR ANOMALIES AND THEIR TREATMENT

VASCULAR TUMOURS

1 INFANTILE HAEMANGIOMAS

Infantile haemangiomas (IH) are a type of vascular tumour that presents in the first three to four weeks of life as enlarging red or bluish papules or nodules (Figure 3). They grow in breadth and depth over four to five months and thereafter, they slow in growth until the child is about a year old before beginning to involute.

IHs are the most common vascular tumours in children, affecting 2-4% of infants. They are more common in females, premature infants and twins.

Complications

Most IHs are uncomplicated with minimal cosmetic concern and can be observed for spontaneous resolution. Small IHs can involute to near-normal skin. Large IHs, however, if left untreated, may involute with residual fibrofatty change, telangiectasia and skin atrophy.

A handful of IHs may lead to life-threatening or function-threatening complications or have the potential to cause severe cosmetic disfigurement.

Complicated IHs require prompt referral to a specialist centre, as early treatment within the first six months of life can reduce the following complications:

- Large IHs on the head and neck region may be associated with eye, brain and heart abnormalities (PHACE syndrome), while those in the groin, perineal or sacral region may be associated with spinal and genitourinary abnormalities (PELVIS syndrome)
- IHs at certain sites (e.g., lip, groin, neck and ear) may ulcerate and lead to pain, infection and scarring
- Multiple IHs (five or more) may be associated with visceral involvement (e.g., liver or spleen) and consumptive hypothyroidism

Treatment

Both systemic (e.g., propranolol) and topical (e.g., timolol) beta-blockers have been shown to be highly effective in the treatment of complicated IHs if started within the first year of life.

Lasers, such as PDL, can also be used to treat IHs.

Occasionally, reconstructive surgery may be required for large, pedunculated IHs or for treatment of residual cosmetic concerns. Radiological interventions such as embolisation may be required for large visceral IHs that are associated with high-output cardiac failure.

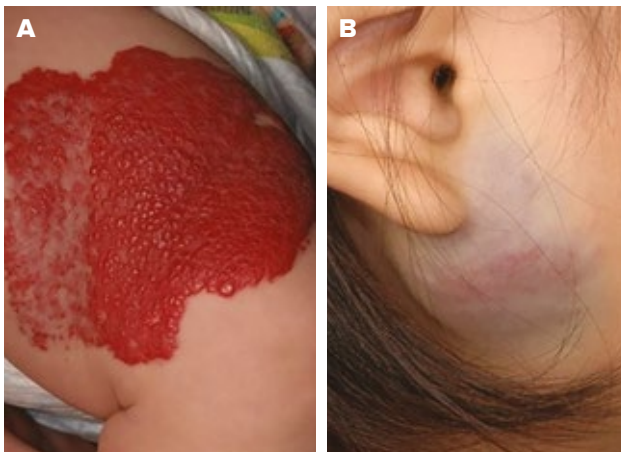


Figure 3 Superficial (A) and deep (B) infantile haemangiomas

2 KASABACH-MERRITT SYNDROME, KAPOSIFORM HAEMANGIOENDOTHELIOMA AND TUFTED ANGIOMA

Kasabach-Merritt syndrome (KMS) is characterised by thrombocytopenia, coagulopathy and microangiopathic haemolytic anaemia, and can lead to severe bleeding in a child due to low platelets and clotting factors.

The syndrome is associated with a rapidly expanding kaposiform haemangi endothelioma (KHE) (*Figure 4*) and tufted angioma (TA), which are uncommon vascular tumours presenting in infancy.

The vascular lesion commonly becomes enlarged and indurated, and infants can present with bleeding manifestations such as ecchymoses, epistaxis, haematochezia and haematuria.

Diagnosis

Although both KHE and TA can be locally aggressive, they may also undergo spontaneous involution. Diagnosis of KHE and TA is made based on clinical, radiological (ultrasound or magnetic resonance imaging [MRI]) and histological features.

Treatment

Treatment of KMS, KHE and TA may require different regimens and a multidisciplinary approach.

Management options include systemic high-dose corticosteroids, antifibrinolytics, interferons, vincristine and antithrombotics.

More recently, the use of mTOR (mammalian target of rapamycin) inhibitors has proven to be effective in reducing both KMS as well as the size of the underlying tumour. Surgery, embolisation and radiation may also be occasionally required.



Figure 4 Kaposiform haemangi endothelioma presenting on the limb of an infant

VASCULAR MALFORMATIONS

1 CAPILLARY MALFORMATIONS / PORT-WINE STAINS

Capillary malformations or port-wine stains (PWS) initially appear flat (*Figure 5*) but may thicken and appear hypertrophic during adulthood. The commonest form of vascular malformations, they usually present at birth and grow in proportion to the child.

Complications

Certain PWS may result in significant cosmetic disfigurement. Pyogenic granuloma-like lesions that lead to recurrent bleeding can also develop.

Large PWS affecting the forehead or eyelids may be associated with Sturge-Weber syndrome (SWS), with cranial and ophthalmological associations. These patients require brain imaging and regular eye examinations. Seizures and developmental delays are common neurological manifestations of SWS.

Treatment

PWS can be treated with lasers such as PDL or Nd:YAG laser. Treatments can begin within the first few months of life and require multiple sessions, usually one to two months apart.

Hypertrophic PWS may require reconstructive surgery or interventional ablation.



Figure 5 Port-wine stain / capillary malformation on the face of a newborn

2 VENOUS AND LYMPHATIC MALFORMATIONS

The next most common forms of vascular malformations, venous and lymphatic malformations, appear as soft, bluish-to-purplish swellings (*Figure 6*).

They usually present within the first few years of life but can also become prominent during puberty, or less commonly, in adulthood.

Diagnosis

Although mostly asymptomatic, they can present with pain, bleeding, thrombosis and secondary infection. Diagnosis is made on clinical, radiological (e.g., ultrasound and MRI) and occasionally, histological features.

Recently, an increasing number of somatic genetic mutations have been discovered in these vascular anomalies (e.g., *PIK3CA*). Genetic testing may be offered in some cases to guide management.

Treatment

Small, asymptomatic lesions may be left alone, while treatment is recommended for larger lesions, especially if symptomatic. Various treatment modalities are often combined for optimal results, including systemic medications (e.g., mTOR or *PIK3CA* inhibitors), sclerotherapy, lasers and surgery.



Figure 6 Venolymphatic malformation on the buttock and thigh of a child

3 VASCULAR MALFORMATION SYNDROMES

Some vascular malformations may be associated with other abnormalities, such as tissue overgrowth, bony and visceral involvement, soft tissue tumours and epidermal nevi. These 'vascular malformations syndromes' are rare but have the potential to lead to severe physical and psychosocial impairment.

Somatic mosaic mutations in *PIK3CA* have been found in the *PIK3CA*-related overgrowth spectrum (PROS). These include Klippel-Trenaunay syndrome (Figure 7) and congenital lipomatous overgrowth, vascular malformations, epidermal nevi and scoliosis/skeletal/spinal anomalies (CLOVES) syndrome. Patients with PROS present with asymmetric limb overgrowth associated with various slow-flow vascular malformations.

Treatment

Multimodal and multidisciplinary treatment is required for these patients, including sclerotherapy, embolisation, systemic medications (e.g., mTOR and *PIK3CA* inhibitors), lasers and surgery.



Figure 7 Klippel-Trenaunay syndrome affecting the right leg of a child, with capillary malformations, venolymphatic malformations and limb hypertrophy

“More complex and severe vascular anomalies should ideally be managed under the care of a multidisciplinary team in centres specialising in their management.”

CONCLUSION

Vascular anomalies comprise vascular tumours and vascular malformations. They commonly present in childhood but can also occur in adolescents and adults.

The ISSVA classification has provided a basis for accurate and timely diagnosis of vascular anomalies. Accurate diagnosis is of paramount importance in deciding on the management of these patients.

Complicated vascular anomalies should be diagnosed and managed by a multidisciplinary vascular anomalies team, utilising multimodal treatment for optimal treatment outcomes.

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Singapore General Hospital
6326 6060

Changi General Hospital
6788 3003

Sengkang General Hospital
6930 6000

KK Women's and Children's Hospital
6692 2984

National Heart Centre Singapore
6704 2222



Renovascular Hypertension

– Diagnosis and Management in Primary Care

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General practitioners (GPs) in Singapore are well-placed to diagnose most cases of renal artery stenosis and manage renovascular hypertension through medical therapy. A subset of patients may benefit from shared care with a specialist, and other treatment options including angioplasty and revascularisation therapy. Find out how we can work closely together with GPs to provide the best care for patients.

INTRODUCTION

Renovascular disease is one of the most common potentially correctable causes of secondary hypertension and often leads to resistant hypertension.

Renovascular hypertension is a result of reduced renal perfusion from renal artery stenosis (RAS) and subsequent activation of the renin-angiotensin-aldosterone system (RAAS). RAS can progress and cause ischaemic nephropathy from a chronic reduction in glomerular filtration rate.

Most cases of renovascular hypertension are caused by atherosclerosis, followed by fibromuscular dysplasia (FMD).

PREVALENCE OF RENOVASCULAR HYPERTENSION

The incidence of renovascular hypertension varies by clinical setting. It accounts for less than 1% of mild-to-moderate elevations in blood pressure.¹ Its prevalence is much higher in patients with acute, severe or refractory hypertension.² This often occurs superimposed upon cases with pre-existing hypertension.

PATIENT PROFILE AND SYMPTOMS

Patient profiles

Cases caused by atherosclerosis

Atherosclerotic renovascular disease is more common in patients with pre-existing atherosclerotic conditions such as coronary or peripheral arterial disease, and usually involves the aortic orifice or the proximal main renal artery.

Risk factors for atherosclerotic disease are often present, such as hyperlipidaemia, cigarette smoking and an age of over 55 years.

Cases caused by fibromuscular dysplasia

In contrast to atherosclerosis, FMD usually occurs in young women (< 35 years of age) presenting with an abrupt onset of hypertension, and typically involves the distal main renal artery or the intrarenal branches.

Symptoms

Clinical features suggestive of renovascular disease are described in [Table 1](#) below.

Clinical features suggestive of renovascular disease
1. Unexplained creatinine elevation and/or acute and persistent elevation in serum creatinine of at least 50%, after administration of angiotensin-converting-enzyme (ACE) inhibitors or angiotensin receptor blockers (ARB)
2. Moderate-to-severe hypertension in a patient with diffuse atherosclerosis, a unilateral small kidney or asymmetry in kidney size of > 1.5 cm that cannot be explained by another reason
3. Moderate-to-severe hypertension in patients with recurrent episodes of flash pulmonary oedema
4. Onset of hypertension with blood pressure > 160/100 mmHg after the age of 55 years
5. Systolic or diastolic abdominal bruit

Table 1

EVALUATION AND DIAGNOSIS

Routine testing for renovascular disease may not change its management as current available evidence suggests that medical therapy may be as beneficial as invasive procedures, especially for those with atherosclerotic renovascular disease.

However, renal artery imaging should always be considered in young patients with resistant hypertension, and if clinical suspicion for FMD is high.

Renal Doppler ultrasonography

Renal Doppler ultrasonography is a reasonable imaging modality as it is relatively inexpensive, non-invasive and does not involve administration of contrast.

Magnetic resonance or computed tomography angiography has higher diagnostic utility, but are potentially harmful in patients with advanced chronic kidney disease given the risk of contrast nephropathy and gadolinium-induced nephrogenic systemic fibrosis.

A stenosis > 75% in one or both renal arteries or > 50% with post-stenotic dilatation suggests the diagnosis.

Renal intra-arterial angiography

Renal intra-arterial angiography is the gold standard.

It can be considered if other non-invasive tests are negative, clinical suspicion is high, and for patients on whom a corrective procedure will be performed if renovascular disease is detected or progresses.

It is not recommended as a routine test due to adverse risks such as contrast nephropathy and cholesterol emboli. It should not be done for those who respond well to medical therapy or are less likely to benefit from revascularisation (e.g., patients with advanced chronic kidney disease).

TREATMENT OPTIONS BY GPs

Medical therapy

Medical therapy is the first-line treatment approach to atherosclerotic renovascular hypertension. This includes the correction of modifiable cardiovascular risk factors such as hypercholesterolaemia, smoking and obesity.

Often, multiple antihypertensives are required. The use of ACE inhibitors or ARBs is recommended to counteract the inappropriately overactive RAAS.

Kidney function should be checked two weeks after the addition of an ACE inhibitor or ARB to ensure that the serum creatinine does not increase, and the ACE inhibitor or ARB can be continued if there is a < 25% rise in the serum creatinine from baseline.

WHEN TO REFER FOR SPECIALIST CARE

GPs may be the main party involved in diagnosing renal artery stenosis.

Referral to specialist care may be considered for patients with RAS and the clinical features described in [Table 2](#), where a multidisciplinary team consisting of a nephrologist, cardiologist and interventional radiologist can help with management.

Clinical features indicating GP referral to specialist care

1. A short duration (weeks or months) of blood pressure elevation prior to the diagnosis of renovascular disease (even if the blood pressure can be controlled with drug therapy)
2. Intolerance to optimal medical therapy (e.g., a clinically significant rise in serum creatinine after initiation of ACE inhibitor or ARB)
3. Progressive deterioration in renal function that is thought to be a consequence of bilateral renovascular disease
4. Progressive deterioration in renal function that is thought to be a consequence of unilateral stenosis affecting a solitary functioning kidney
5. Recurrent flash pulmonary oedema and/or refractory heart failure
6. Suspected fibromuscular disease in a young person

Table 2

TREATMENT OPTIONS BY SPECIALISTS

Revascularisation therapy

Revascularisation therapy with percutaneous angioplasty with or without stenting of the renal artery is second-line therapy.

A recent meta-analysis of nine randomised controlled trials concluded that renal artery angioplasty did not confer additional benefits above optimal medical therapy in patients with atherosclerotic renovascular disease, except in cases of refractory hypertension.⁴

Candidates for revascularisation should be carefully selected (see **Table 2** for indications to consider revascularisation).

Angioplasty

As the pathophysiology of FMD is different compared to that of atherosclerotic renovascular disease, angioplasty is a therapeutic option for such patients.

Studies have suggested that angioplasty alone may improve blood pressure and even cure hypertension. Surgery may be indicated in very selected patients who have complex anatomic lesions (e.g., multiple small renal arteries, failed previous endovascular treatment).



Figure 1 Arteriogram showing a focal stenosis of the left renal artery with post-stenotic dilatation (indicated by the arrow)



Figure 2 Arteriogram after a percutaneous angioplasty has largely corrected the stenotic lesion in the right renal artery (indicated by the arrow)

SHARED CARE – THE GP'S ROLE IN TREATMENT

Pre-care

GPs in Singapore are well-placed to manage hypertension. A subset of patients with renovascular hypertension may require the multidisciplinary care that the **SingHealth Duke-NUS Vascular Centre (SDVC)** offers.

If a GP feels that their patients require a more comprehensive approach to managing this condition (see **Table 2**), they may refer them to the Centre for further management.

Ongoing care

The specialists in the SDVC welcome collaboration with the patients' GPs to provide the best care possible. Patients may choose to continue to follow up with their GP for the management of other chronic medical conditions such as diabetes, hyperlipidaemia and obesity.

Post-care and shared care

We welcome the opportunity to co-manage patients with GPs, who remain central to their care. It is common for patients to see specialists and dietitians at the Centre, while continuing to follow up with their GPs for other chronic medical conditions.

THE SINGHEALTH DUKE-NUS VASCULAR CENTRE

The SDVC was established in February 2021 to bring together the strengths of healthcare professionals from different specialities across SingHealth institutions.

It aims to provide seamless and holistic care for patients with vascular diseases related to disorders of the arteries, veins and lymphatics, including renal artery stenosis.

The care for a vascular patient is often complex, and usually involves coordination by the primary clinician to ensure the patient's care needs are met.

Many of these conditions can now be managed by minimally invasive endovascular procedures

without the need for open surgery, and many of these techniques have become the standard of care. Several specialists including vascular surgeons, cardiac surgeons, interventional radiologists, interventional nephrologists and interventional cardiologists perform endovascular procedures to treat these conditions.

Our centre collaborates with researchers and educators from SingHealth institutions and Duke-NUS Medical School to deepen knowledge in the causes of vascular diseases, drive innovation to find better ways to diagnose and treat conditions, and ensure healthcare professionals have the skills they need to provide the best care for patients.

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Acute Aortic Syndrome

– Recognition in Primary Care and Treatments

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Acute aortic syndrome covers a spectrum of potentially life-threatening aortic diseases and often requires immediate medical attention. This article outlines their clinical presentations, diagnosis and available treatments – including thoracic endovascular aortic repair (TEVAR), an emerging alternative to conventional open surgery.

INTRODUCTION

Acute aortic syndrome describes a myriad of life-threatening aortic diseases. Their presentations can be similar and clinical features are generally comparable in terms of symptoms, signs as well as epidemiological and imaging features.

The conditions include aortic dissection, aortic intramural haematoma, leaking aortic aneurysms and penetrating atherosclerotic ulcers.

Aortic dissection

Aortic dissection occurs when an **injury to the innermost layer of the aorta allows blood to flow between the layers of aortic wall, forcing the layers apart.** In this disease process, there is reduced or absent blood supply to the various vital organs at times.

Intramural haematoma

Intramural haematoma is defined as **blood within the aortic media without the presence of an intimal tear.** Its causes range from the rupture of vasa vasorum of the media or haemorrhage within an atherosclerotic plaque, to progression from a penetrating aortic ulcer. It may progress and increase in size, and is at a greater risk of rupture than dissection.

Penetrating aortic ulcers

Penetrating aortic ulcers are defined as **focal intimal defects occurring at the site of atherosclerotic plaques.** Progressive intimal erosion eventually results in pulsatile blood entering the media. This can lead to intramural haematomas, dissections and ruptures, as well as pseudoaneurysm and aneurysm formation.

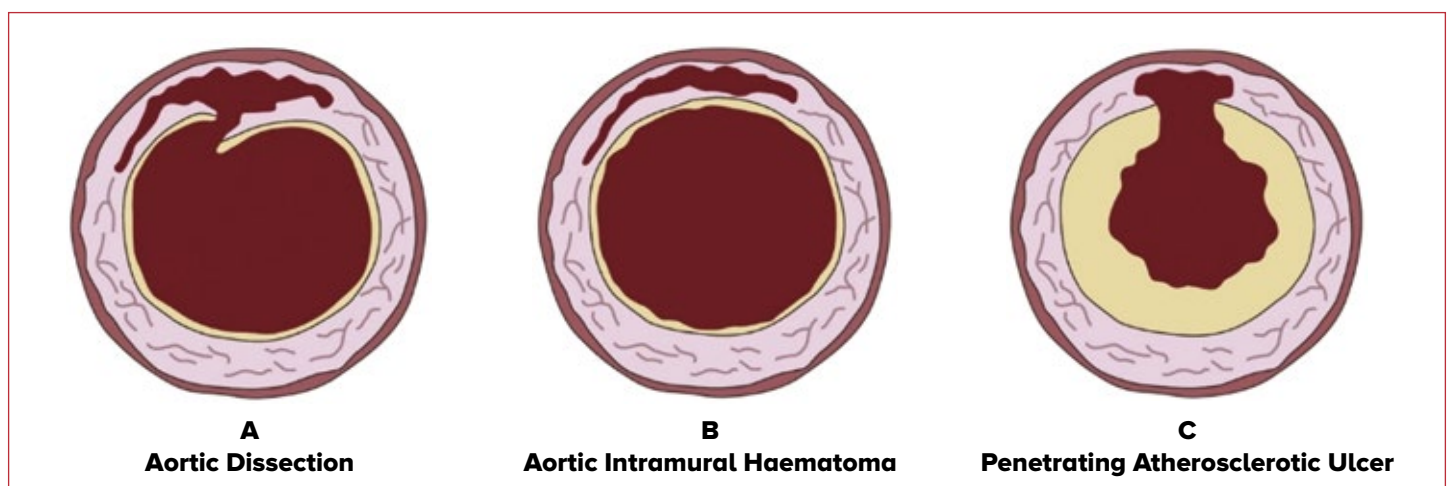


Figure 1 Acute aortic syndrome

EPIDEMIOLOGY

Aortovascular diseases have been increasing in incidence over the years. This can be attributed to the ageing population and use of surveillance scans.

These patients are usually elderly, smokers and male with a past medical history of hypertension. A lot of them are non-compliant to medications and in some cases, undiagnosed.

Rare cases that general practitioners (GPs) may encounter in the community include:

- Connective tissue disorders (mainly Marfan syndrome and Ehlers-Danlos syndrome)
- Bicuspid aortic valve
- Annuloaortic ectasia

CLINICAL PRESENTATION AND DIAGNOSIS

Symptoms

A classical symptom is an **acute tearing chest pain radiating to the back**.

The location of the pain correlates with the location of pathology. Pain located anteriorly in the chest or in the neck and jaw typically denotes ascending aortic involvement. In contrast, pain in the back and abdomen suggests descending aortic pathology.

Patients are usually severely hypertensive. If a patient is hypotensive, this is a bad sign and the risk of death can be imminent.

Radiographic features

Chest X-ray usually shows widened mediastinum. *Computed tomography (CT)* imaging is readily available in most centres, and has high sensitivity and specificity. Most importantly, it is a quick scan.

Alternatives include *magnetic resonance imaging (MRI)* and *transoesophageal echocardiography*; however, these may not be readily available.

In many emergency departments, *transthoracic echocardiography* is readily available which can give a clue to the diagnosis.

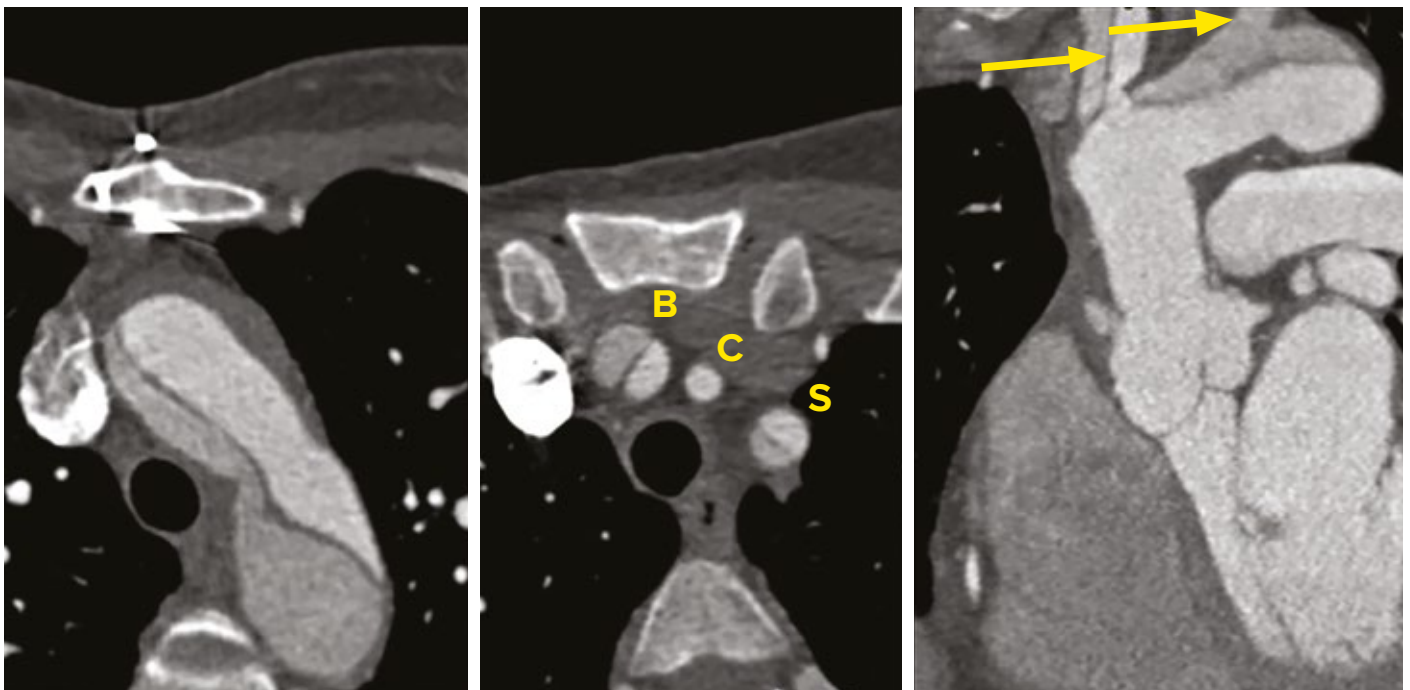


Figure 2 CT angiography obtained in a patient with dissection of the aortic arch is clearly demonstrated on axial imaging (*left panel*). Involvement of the brachiocephalic (B) and left subclavian (S) ostia is apparent on a more cranial axial image (*middle panel*), whereas the origin of the left common carotid artery (C) is spared.

A multiplanar image reformatted in an oblique sagittal plane (*right panel*) nicely renders false lumen in the brachiocephalic (long arrow) and left subclavian (short arrow) arteries.

TREATMENT OPTIONS

The diagnosis of the aortic pathology determines its management.

Not all conditions require immediate or early interventions. In mild cases, patients are serially monitored with the use of scans.

Blood pressure control helps slow the disease process, and stopping smoking further helps the patient's cause.

For acute aortic syndrome involving the ascending aorta

Aortic pathology involving the ascending aorta is treated with **emergency high-risk open surgery**.

Emergency surgery includes the replacement of the ascending aorta under **deep hypothermic circulatory arrest**.

Deep hypothermic circulatory arrest is a surgical technique that induces deep medical hypothermia. It involves cooling the body to temperatures between 16-25°C and stopping blood circulation and brain function for 45-60 minutes.

During this time, the ascending aorta is excised, and synthetic graft is sutured to the proximal aortic arch. After which, circulation is resumed and rest of the surgery continues.

At the normal body temperature of 37°C, only several minutes of stopped blood circulation causes changes within the brain leading to permanent damage. Lowering the body temperature extends the time interval in which such stoppage can be survived.

At a brain temperature of 16-18°C, blood circulation can be safely stopped for 45-60 minutes. There is an increased incidence of brain injury at time intervals longer than 45-60 minutes.

For acute aortic syndrome sparing the ascending aorta

More distal disease sparing the ascending aorta is treated with **medical therapy**.

Patients with acute aortic syndrome sparing the ascending aorta were usually offered high-risk conventional open surgeries in the past. Today, a selected group of patients are suitable for **thoracic endovascular aortic repair (TEVAR)**.

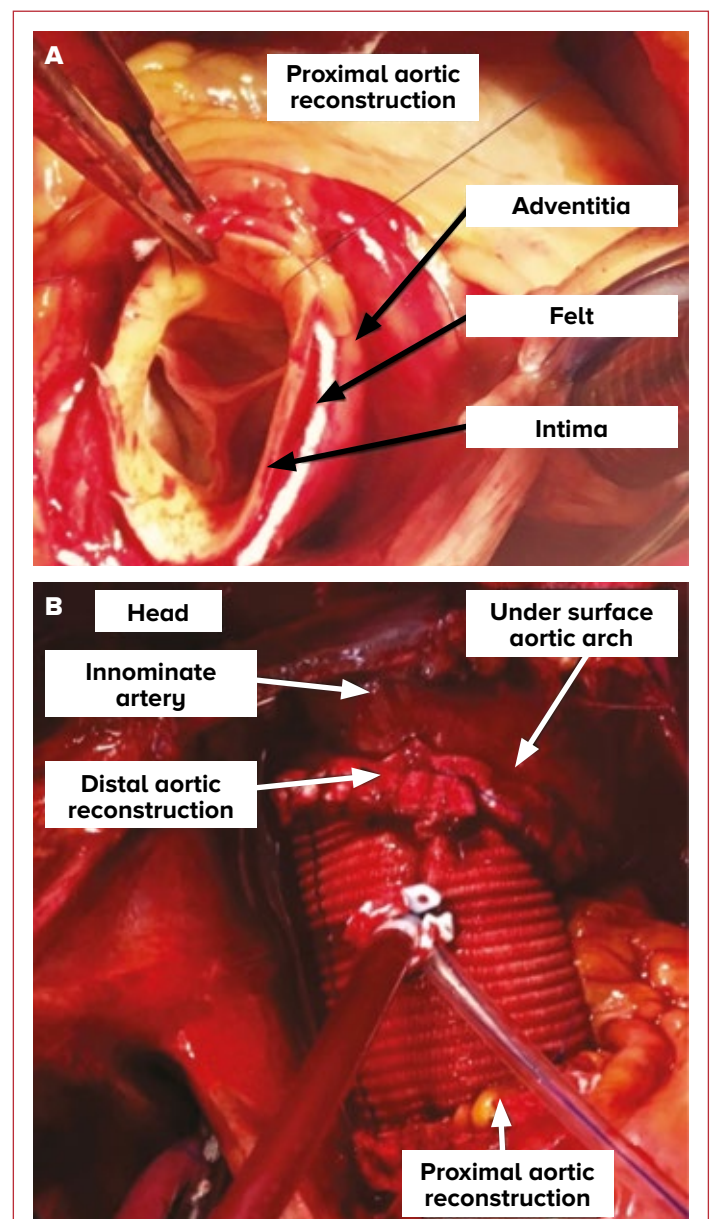


Figure 3

- A.** Cut portion of aorta showing aortic valve and aortic wall
- B.** Completed ascending aorta replacement including proximal and distal anastomosis

TEVAR – AN ALTERNATIVE TO CONVENTIONAL OPEN SURGERY

Benefits of TEVAR

TEVAR has emerged as an alternative to conventional open surgery.

Many of the patients who suffer from aortovascular conditions are elderly, frail and have a number of medical conditions – including patients who previously would not have qualified for any intervention. TEVAR thus increases the population of patients who can be treated.

The TEVAR procedure

Patients are typically under general anaesthesia, and the TEVAR procedure is performed in a hybrid operating theatre under X-ray guidance.

During the procedure, a tube or catheter is inserted into the femoral artery in the groin. A wire is guided through the artery into the aorta. A stent graft is delivered in a collapsed state through the catheter, positioned accurately using X-ray guidance.

The stent graft is then expanded to span and cover the site of aortic injury. As a result, the stent graft lines and reinforces the torn aortic wall to ensure continuity of blood flow and prevent further bleeding.

This procedure usually takes about one to three hours.

Post-procedure recovery and care

Patients typically stay in the hospital for three to four days and can resume all regular activities within a month. Complex cases may require a longer procedure time and hospital stay. Follow-up is lifelong with serial scans.

TEVAR vs open surgery

The main procedural risks of TEVAR include catastrophic paraplegia which can be mitigated with spinal drain insertion and permissive hypertension. Other risks include bleeding, infection and stroke.

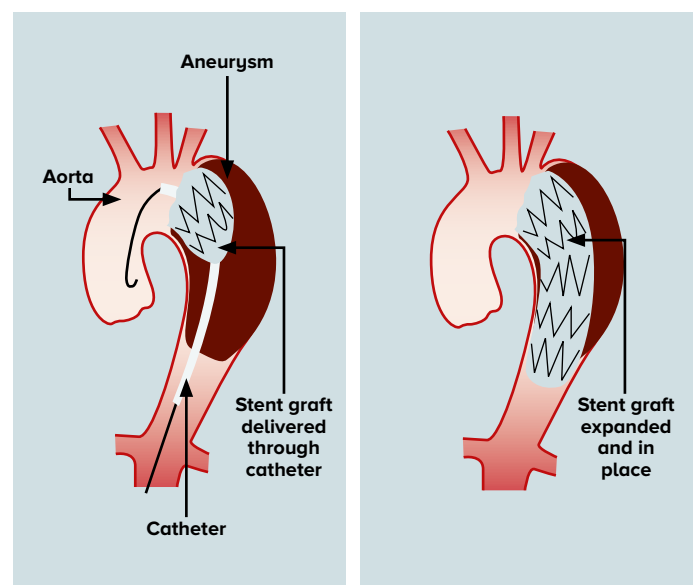
Overall, despite these risks, it provides the advantage of being **less invasive** than open surgery and requiring a **shorter recovery time**. It also **gives hope to patients who are at high or prohibitive surgical risk**.

Continued enhancements

In the past, the femoral artery in the groin was accessed using a surgical incision and subsequently repaired post-procedure. However, in recent times, percutaneous closure devices have had success in furthering the procedure.

Today, the painful surgical incision in the groin has been replaced by percutaneous closure devices. **The TEVAR procedure is evolving into a truly minimally invasive surgery.**

In the last few years, TEVAR technology has had further enhancements. **Stents can be custom-built for each patient's vascular anatomy.** However, the time needed to build each customised stent is about four to six weeks.



PROGNOSIS

Up to 30% of these acute aortic syndrome cases may have serious complications at the time of presentation.

These can include:

- Aortic rupture leading to immediate death
- Haemopericardium with tamponade features
- Acute severe aortic valve dysfunction
- Coronary artery dissection and/or occlusion
 - In the case of left main occlusion, there is almost always instant death
 - In the case of right coronary occlusion/ dissection, the patient presents with massive inferior myocardial infarction with bradycardia

- Aortic branch dissection and/or occlusion that can lead to strokes
- End-organ ischaemia or infarction – these can present as acute renal failure and bowel/limb ischaemia

The National Heart Centre Singapore cardiovascular team evaluates and follows up with these patients to determine the timing and type of intervention. Those with extensive aortic disease may require a combination of both open and endovascular surgery.

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Changi General Hospital
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Sengkang General Hospital
6930 6000

KK Women's and Children's Hospital
6692 2984

National Heart Centre Singapore
6704 2222



Understanding Diabetes and Chronic Limb-Threatening Ischaemia – Imaging, Surgery and Wound Healing

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Department of Vascular Surgery, Singapore General Hospital*

Persons with diabetes are at risk of chronic limb-threatening ischaemia. While treating ischaemia is crucial, care beyond surgical treatment is also crucial to recovery. We share how a customised approach with a multidisciplinary team is the best approach to the disease.

INTRODUCTION

Diabetes mellitus has increased in prevalence over the years and now affects 400 million globally.¹

Diabetic patients are at risk of **chronic limb-threatening ischaemia (CLTI)** as 25% of them develop a foot ulcer, and 80% of major amputations begin as one.¹

Many may not experience classic rest pain or prior claudication, and have a falsely raised ankle-brachial index. Poor perfusion, peripheral neuropathy and immunocompromised states lead to delayed presentation, extensive wounds and infections which render limbs unsalvageable.

While people are increasingly familiar with the diabetic foot from the media, relatives and friends, delayed presentation is common due to the initial ignorance or unnoticed tissue trauma. Others lack proper foot care, education and surveillance.

CLTI is part of a broad disease spectrum where treating ischaemia, while crucial, is only one determinant of success. Through a case study, this article hopes to show that customised treatment taken on by a multidisciplinary team is the best approach to the disease.²

CASE STUDY

Background

Mr A was 55 years old and a smoker of 30 pack-years, with a body mass index (BMI) of 32.

He had been diabetic for five years (HbA1c 10.2%) and underwent coronary bypass at 54 years of age. He has stage 3 kidney disease and an incidental asymptomatic left carotid stenosis for which he declined intervention.

Presentation

He presented with wet gangrene of his right second to fourth toes, associated with fever and hypotension three weeks after he knocked his toes during a brief syncopal episode.



Amputation

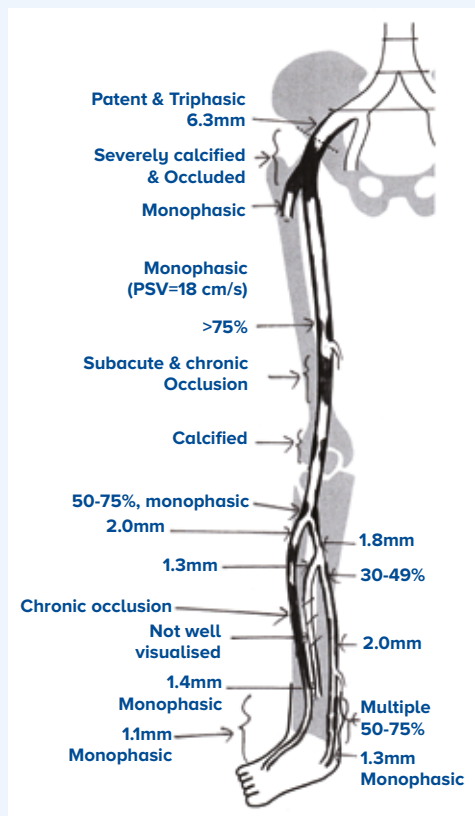
Mr A underwent emergent second-to-fifth-toe ray amputation with a plantar slit to allow drainage of purulent infection. His fifth toe was involved and had osteomyelitis on radiograph.



Post-debridement

Imaging

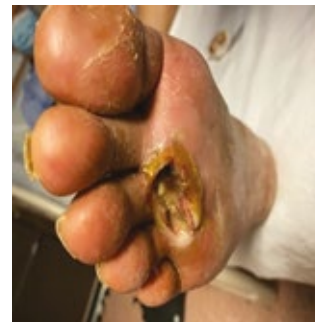
Being a smoker with poorly-controlled diabetes, Mr A's lower limb arterial duplex showed multi-level calcified steno-occlusive disease of the common femoral artery (CFA), superficial femoral artery (SFA) and below-the-knee (BTK) tibial disease. He had a toe pressure measurement of 15 mmHg.



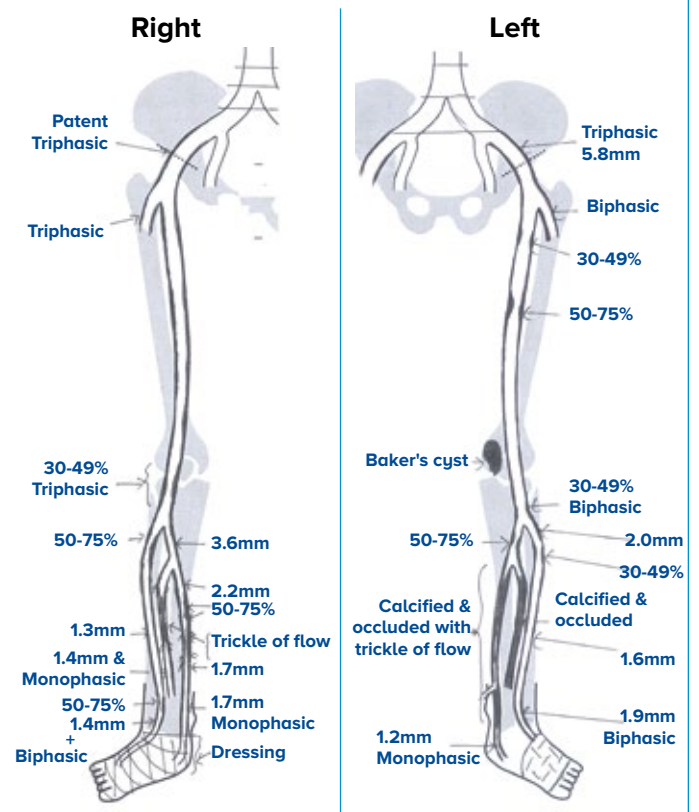
Ultrasound arterial duplex of Mr A's right lower limb

In stable patients, it is preferable to do same-setting revascularisation and amputation. However, when in septic shock, time is of the essence and the removal of the septic source must not be delayed.

CLTI may also present as ulcers or abscesses in web spaces and pressure areas from ill-fitted footwear.



Long segment and small BTK tibial vessel disease with poor-to-no below-ankle perfusion is typical of CLTI patients.



TECHNICAL CONSIDERATIONS IN IMAGING AND SURGERY

Angioplasty rather than bypass is the mainstay of treatment, but without established target out-flow, primary amputation to an infection-free, well-perfused level may be the only option.

Use of imaging to guide treatment

In patients without a palpable femoral pulse and when the proximal inflow cannot be assessed on ultrasound, a computed tomography scan or magnetic resonance aortoiliac is required.

Concomitant aortic or proximal disease can be visualised and determines whether a contralateral retrograde or upper limb access is necessary for angioplasty.

In severely stenotic or occluded CFA disease, an open endarterectomy is preferred for a hybrid open-endovascular procedure. It is thus useful to identify a non-calcified proximal 'clamp-able' segment and its relation to the inguinal ligament preoperatively for open surgery.

Imaging can also show acute or subacute features where thrombolysis or thrombectomy with aspiration devices may be required.

Contrast use for imaging and angioplasty may worsen renal function. This can be minimised with the use of carbon dioxide for angiograms, pre-surgery hydration and avoidance of nephrotoxic agents.

Endovascular therapy

Endovascular therapy is well-established for lower limb revascularisation.³

A sheath is placed in an access vessel under ultrasound guidance (usually CFA) and a digital subtraction angiogram (DSA) is performed. Intra-arterial heparin is administered and wires are used to transverse vessel lesions so as to deploy balloon(s) across.

Balloon insufflation establishes lumen, treating the stenosis or occlusion.

SAFARI technique

In long segment disease, it is sometimes necessary to employ a **subintimal arterial flossing with antegrade-retrograde intervention (SAFARI) technique** where 'true lumen' percutaneous access from two directions is used to 'cross a lesion' to obtain a through and through passage.

Increasingly, atherectomy devices are used to achieve luminal gain before balloon angioplasty to reduce vessel dissection.

Stenting

Stenting is necessary when there is significant or persistent vessel recoil, dissection, high clot burden and perforation. They are costly and surveillance is required as they can re-stenose or occlude over time.

Data for and against drug elution technology (paclitaxel- or sirolimus-based) exist.⁴ These are generally used for short-interval recurrent disease and may add duration to vessel patency.

Angioplasty

Angioplasty aims to provide straight-line flow to the wound that is ideally angiosome based, or to re-establish a plantar arch when possible.

Bypass

When flow cannot be achieved in an intervening segment (e.g., SFA) or in stent failure, a bypass option with native vein or graft is possible.

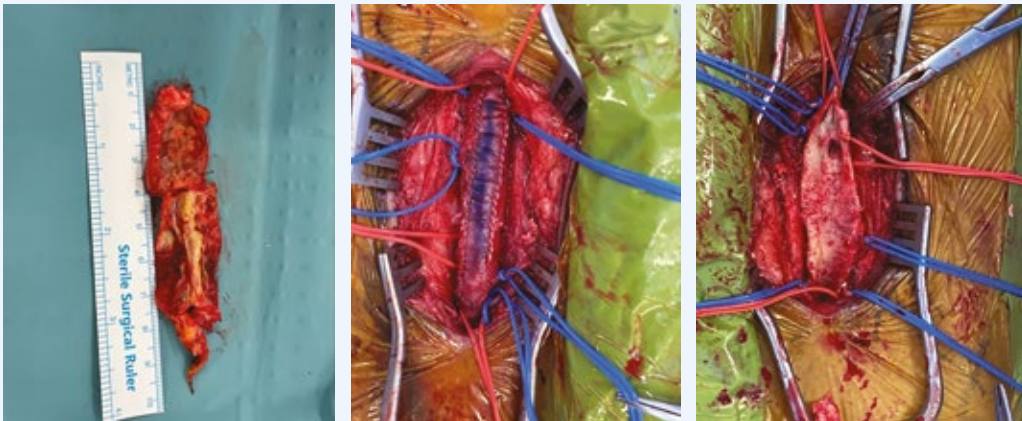
Bypass procedures have higher perioperative risks, longer operative times and hospital stays. They are at risk of wound and graft infections and are subjected to the availability of conduits such as native veins. Native-vein, above-tibial bypasses have the best long-term results.

Bypasses are performed for fitter patients with reasonable premorbid ambulatory status and cardiac ejection fraction.

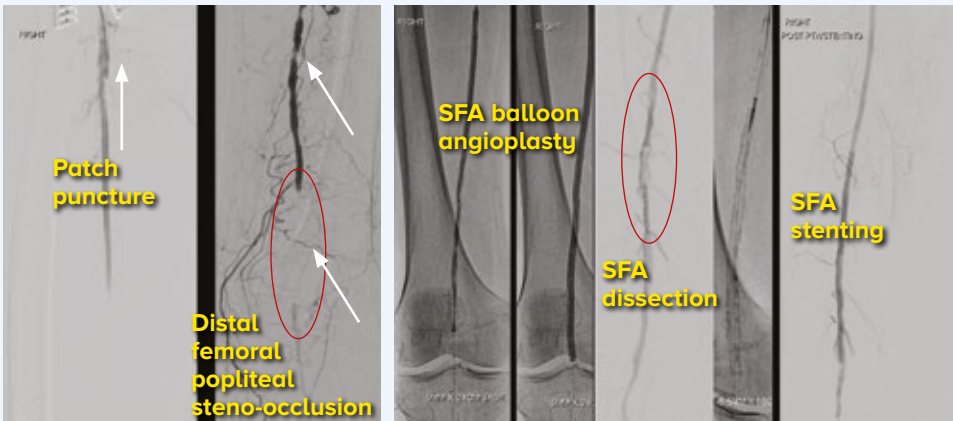
CASE STUDY

Surgery

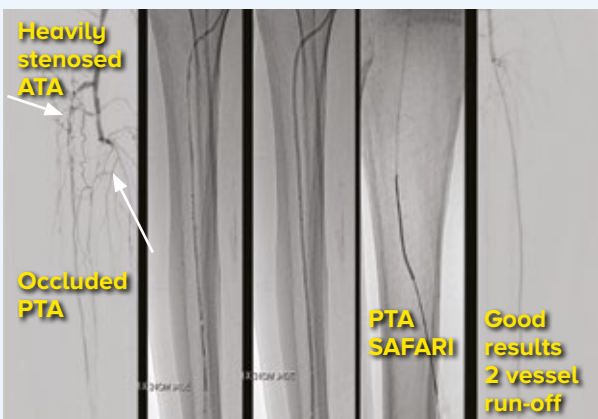
Mr A underwent a hybrid procedure consisting of an open common femoral endarterectomy, followed by a bovine patch repair. A sheath was then placed antegrade into the patch to perform the angiogram and angioplasty of the infrainguinal vessels.



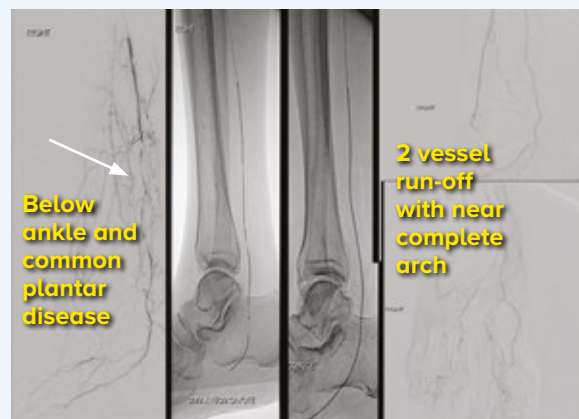
Femoral endarterectomy and patch repair along with removed calcified plaque



Angiographic images showing CFA patch puncture, femoral popliteal disease, balloon dissection, stent deployment and restored flow



BTK-anterior tibial angioplasty (ATA), posterior tibial artery (PTA) SAFARI



Distal percutaneous transluminal angioplasty and common plantar angioplasty

WOUND HEALING AND RECOVERY

Monitoring and care

Wound healing requires appropriate culture-directed antibiotics, avoidance of new trauma, maintaining perfusion and optimising care of existing cardiac, renal, glycaemic, ambulatory and nutritional status, while going through ongoing rehabilitation.

Prolonged stays with immobility lead to the development of pressure sores and nosocomial infections, and must be avoided.

The antibiotic duration depends on wound progress and the presence of existing infections such as osteomyelitis or bacteraemia. Inflammatory markers are useful adjuncts and an infectious diseases physician is often consulted.

Vascular access lines may be needed when prolonged treatment is required, but pose a threat when infected and require frequent examination.

Repeat angioplasty may be needed if wound healing is impaired.

Vascular teams, along with dedicated wound nurses and podiatrists, perform regular wound inspections, debridement and dressing changes.

A variety of dressing options including antiseptic solutions, cellulose/collagen-based dressings, hydrocolloids, vacuum-assisted closure devices and hyperbaric therapy or oxygen delivery devices are available for different types of wounds.

Continued wound care

Continued wound care is paramount for success, and step-down facilities such as community hospitals, day care and home nursing facilitate rehabilitation till patients or caregivers are confident to be independent at home.



Wounds contracting and granulating well



New heel wounds

Recovery of heel and pressure wounds

Heel and pressure wounds are challenging as blood flow is poor and offloading, despite best efforts, may not be possible due to immobility.

Wounds after revascularisation are in a race against time as they have a risk of reinfection or deterioration.

Those that granulate well and have been treated for infection should pursue coverage in the form of skin graft or flap performed by either vascular or plastic surgery.



Wound that has deteriorated



Wounds that have healed well with split skin graft / flap



Recovery from major limb amputation

A timely decision to perform amputation will save lives. However, acceptance can be stressful and requires dedicated physicians, social workers and rehabilitation teams.



Well-healed below-the-knee and above-the-knee amputation stumps – rare complications include flap dehiscence and necrosis

When the stump heals, many enjoy sepsis-free, excellent quality of life with earlier return to society and eventual prosthesis fitting.



Extensive wounds – better off with primary amputation

CASE STUDY

Recovery

Mr A's wound healed well with split skin graft and he regained reasonable ambulation after six months.

Two years on, he required a below-the-knee amputation of his other leg when he re-presented with heel gangrene and calcaneal osteomyelitis. Help was sought late due to depression and worries over job commitments. He eventually required hemodialysis as his kidneys failed.

Fortunately, his forefoot remained well and he eventually learned to walk with a below knee prosthesis.

He no longer has open wounds and is able to hold a clerical job. He gets around with a personal mobility device and most importantly, enjoys time with his grandchildren.

**THE DEPARTMENT OF VASCULAR SURGERY
AT SINGAPORE GENERAL HOSPITAL**

The Singapore General Hospital Department of Vascular Surgery performs an average of 400 lower limb angioplasties a year and collaborates closely with the Department of Interventional Radiology.

A retrospective review of 3,303 angioplasty procedures performed on 2,402 limbs from 2005 to

2015 showed salvage rates of 75%, 72% and 62%, and overall survival rates of 79%, 56% and 34% at 1, 5 and 10 years respectively.⁵

The department performs open and hybrid procedures, manages wounds and treats a variety of renal, carotid and aortic conditions.

TAKE-HOME MESSAGES FOR GPs
A vascular consultation is always advised for CLTI.

The treatment varies depending on comorbidities, activities of daily living function, extent of tissue loss, as well as social background and personal beliefs and attitudes. Limb salvage, while ideal, may not always be possible or permanent.

Many go through great physiological and psychological ordeals, and expenses and caregiver stress put a strain on relationships. Others may seek alternative (harmful) therapy or slide into depression.

GPs have preventive roles and can participate in education, wound and emotional care.

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Dr Nick Ng Zhi Peng is an Associate Consultant at the Department of Vascular Surgery in Singapore General Hospital. He graduated from the Yong Loo Lin School of Medicine, National University of Singapore in 2011 and completed his surgical training with the SingHealth General Surgery Residency Programme in 2018. He obtained his Masters of Medicine (Surgery) in 2017 and FRCS (Edinburgh) in March 2019. He has an interest in both open and endovascular surgery and hopes to help patients with chronic limb threatening ischaemia have the best possible quality of life.



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6704 2222





Common Infections of the Hand in Primary Care

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Hand infections are frequently encountered in the primary care setting, where general practitioners (GPs) play a key role in early recognition, diagnosis and treatment. Early detection and management can prevent infections that may lead to prolonged hospitalisation or disability.

INTRODUCTION

Hand infections are common presentations in the acute care setting. The exact incidence of hand infections is difficult to determine as most are self-treated or treated by primary care physicians. However, it is estimated that a major metropolitan hospital can expect 25 to 50 admissions a year for serious hand infections.¹

Why early detection is important

While some hand infections may appear innocuous or mild in the early stages, they **can rapidly progress to devastating infections** requiring surgical debridement, resulting in prolonged hospital admission. Hence, it is essential to recognise and diagnose these infections early and promptly initiate treatment.

In addition, these hand infections **can lead to tissue loss, functional impairment and even permanent disability if left untreated.**



Detecting and Managing Common Hand Infections

The spectrum of hand infections can range from finger infections to deep space infections, caused by many microorganisms – depending on the mechanism of injury, inoculation or occupational exposure. An estimated 65% of hand infections are caused by aerobic organisms, of which 60% are pure gram-positive, and 5% are pure gram-negative.¹

The principles of managing infections are:

- Early recognition
- Early antibiotics initiation
- Early debridement and drainage
- Early rehabilitation
- Early resurfacing if indicated

This article will focus on common hand infections such as:

1. Paronychia
2. Felon
3. Flexor tenosynovitis
4. Bite wounds from animals and humans with associated septic arthritis

1 PARONYCHIA

Paronychia is an **infection of the lateral nail fold surrounding the nail**. It may be acute (duration of less than six weeks) or chronic (duration of six weeks or more).²

Presentation and diagnosis

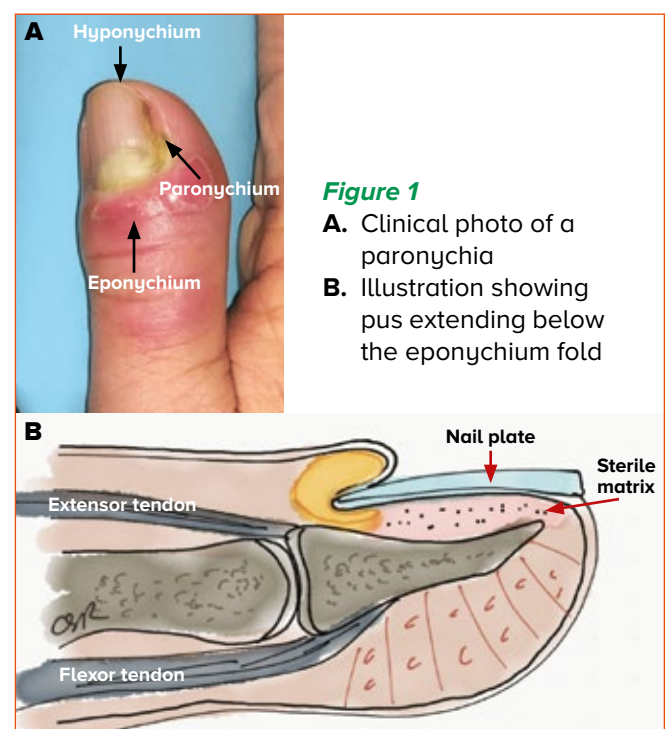
This presents with erythema, swelling, tenderness and occasionally spontaneous discharge of purulent material. It occurs after disruption of the seal between the nail fold and nail plate due to penetrating trauma, nail-biting, manicures or hangnails.

Treatment

In the early stages of paronychia, patients can be treated with warm soaks, systemic oral antibiotics and resting the affected digit. The antibiotic regimen should cover *Staphylococcus aureus*.

If there is a superficial abscess, early drainage is advised by incision of the paronychia fold with a blade directed away from the nail bed and matrix.

In cases with subungual pus, nail avulsion should be performed under a digital block.³ The pus within the perionychium may track volarly to the pulp space presenting with a pulp abscess or felon.



2 FELON

Felon is the second most common hand infection, comprising around 15-20% of cases.⁴ It is defined as a **closed-space subcutaneous infection in the pulp space of the distal phalanx of a digit.**¹

Presentation and diagnosis

There is typically a history of penetrating injury preceding a felon. Symptoms include a tense and tender pulp with erythema and swelling that usually does not extend proximally past the distal interphalangeal joint (DIPJ) flexion crease.

However in severe cases, felons can rupture the DIPJ, causing septic arthritis, and extend into the distal end of the flexor tendon sheath, causing flexor tenosynovitis.¹ A finger radiograph is essential to rule out osteomyelitis of the distal phalanx.

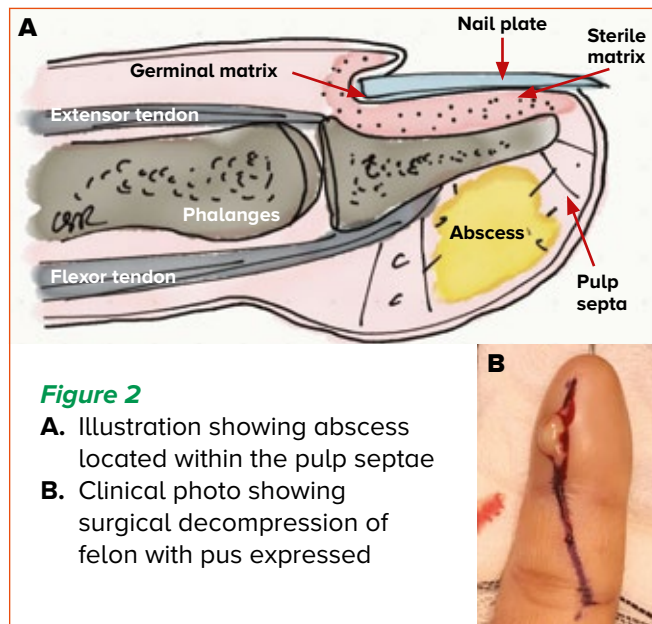


Figure 2

- A.** Illustration showing abscess located within the pulp septae
B. Clinical photo showing surgical decompression of felon with pus expressed

Treatment

Early felons may be treated with antibiotics, rest and elevation.

The most common microorganism involved is *Staphylococcus aureus*, but various aerobic and anaerobic organisms can cause felons. Thus, broad-spectrum antibiotic therapy is essential.¹

However, a tense pulp with the presence of subcutaneous collection is an indication for surgical drainage. A longitudinal midline incision over the pulp area of maximal tenderness is usually made to drain the collection. The pulp septae should be surgically released as well to ensure no hidden collection that may be missed.

The wound is then left open and dressed with a sterile dressing. Dressing changes should be performed every 24-48 hours using sterile soaks and Jelonet dressing. The wound may be left to heal by secondary intention.

3 FLEXOR TENOSYNOVITIS

Flexor tenosynovitis is a **closed space infection of the digital flexor tendon sheath.**

Presentation and diagnosis

This is often accompanied by a history of penetrating injury to the digit, with *Staphylococcus aureus* being the most common organism.

In 1912, Allen Kanavel described four cardinal signs indicative of flexor tenosynovitis:⁵

- Digit held in partial flexion
- Pain upon passive extension
- Fusiform swelling
- Tenderness along the flexor tendon sheath

Factors that predict poor outcomes include:

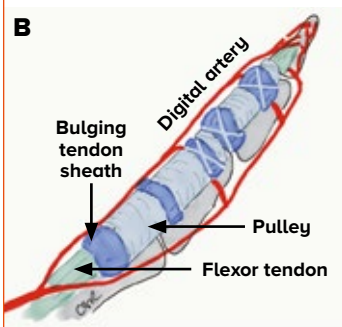
- Presence of digital ischaemia
- Subcutaneous purulence
- Age above 43 years
- Polymicrobial infection
- Presence of comorbidities (diabetes mellitus, renal failure or peripheral vascular disease)

The presence of digital ischaemia and subcutaneous purulence increases the risk of amputation to 59%.⁶

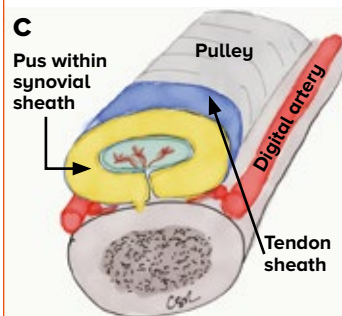


Figure 3

A. Clinical photo showing a partially flexed, swollen and erythematous digit with purulent material expressed from an injured wound



B. Illustration of a bulging tendon sheath (blue) in early flexor tenosynovitis



C. Illustration of pus within the synovial sheath. If not drained early, this can lead to tendon necrosis.

Laboratory investigations may reveal raised inflammatory markers, and the patients may be bacteraemic. Infection of the flexor tendon sheath for the thumb and little finger may spread proximally to the space of Parona and form a horseshoe abscess.

Treatment

Early management includes intravenous antibiotics and elevation. In addition, surgical drainage is indicated, especially with suppurative flexor tenosynovitis.⁷

Figure 4 shows a closed tendon sheath irrigation using an infant feeding catheter. However, in the presence of severe infection with tendon necrosis, open debridement is preferred.⁸



Figure 4 Clinical photo showing the placement of the irrigation catheter in patients with flexor tenosynovitis. We usually irrigate the sheath with normal saline for at least five days using a syringe driver pump at a rate of 10 ml/hour. Closure of the wound is not necessary.

4 SEPTIC ARTHRITIS AND ANIMAL BITES

Septic arthritis in the hand or wrist **results from a puncture wound or an extension of an adjacent tendon sheath infection, subcutaneous abscess or bone infection.** These can lead to the destruction of the joint and osteomyelitis of the phalanges or metacarpals.¹

It can occur following a **‘fight bite’** or an **animal bite.**

Most human bite infections result from a ‘clenched fist injury’ – a laceration over the dorsal metacarpophalangeal joint (MCPJ) from striking teeth with a clenched fist. A tooth can easily penetrate the MCPJ capsule, leading to septic arthritis if left untreated.¹

Dog and cat bites account for more than 90% of all animal bite wounds. Patients with animal bites tend to present late, as these wounds may seem innocuous in the early stages. However, they may have raised inflammatory markers, and plain radiographs may reveal remnant foreign bodies, cortical breaks and bone erosions.

Presentation and diagnosis

Patients with septic arthritis typically present with a swollen, erythematous and painful joint. Needle aspiration of the joint helps

establish the diagnosis and identify the causative microorganism.

Eikenella corrodens is most associated with human bite infections. The most common pathogens cultured from the dog mouth are *Staphylococcus aureus*, *Streptococcus viridans*, *Bacteroides* and *Pasteurella multocida*. *Pasteurella multocida* is especially common in cat saliva.

Treatment

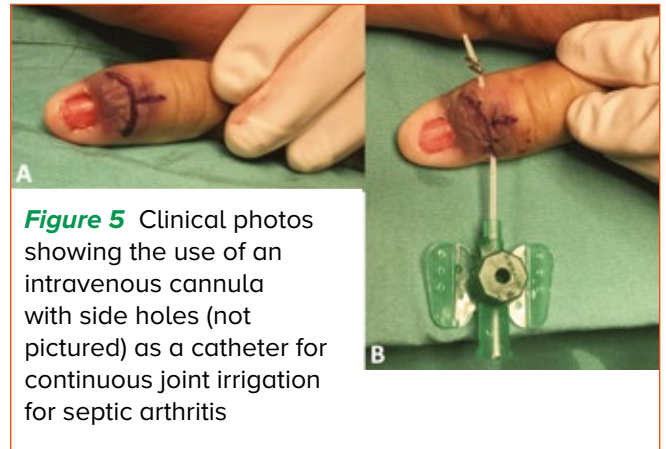
The initial treatment for animal bites should encompass an update of tetanus immunisation and identifying the rabies immunisation status of the animal.

Prompt and thorough irrigation of the wound should be performed after obtaining wound cultures, in addition to broad-spectrum empirical antibiotics cover.

Bite wounds over the hand and wrist joints should be treated as septic arthritis until proven otherwise. Early surgical debridement and joint irrigation are advised.

Figure 5 shows a technique of catheter irrigation of a septic joint of the hand. We routinely perform continuous catheter irrigation for at least five days from the initial debridement. In some cases, open debridement and eventual amputation may be necessary.

The antibiotic duration varies from ten days to six weeks, depending on the organism involved and the clinical improvement of the infection.⁹



WHEN GPs SHOULD REFER

Hand infections are frequently encountered in the primary care setting. Early recognition, diagnosis and treatment are crucial to prevent further progression of infection and eventual amputation.

A thorough medical history, especially for diabetes mellitus, and circumstances of the injury are essential parts of the history taking.

Patients should be promptly referred to the Emergency Department at your nearest hospital for further assessment and surgical management by a hand specialist when in doubt.

Early rehabilitation by performing active and passive motion exercises to prevent joint stiffness is vital for optimum patient outcomes.

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5. Book review: *Infections of the Hand: A Guide to the Surgical Treatment of Acute and Chronic Suppurative Processes in the Fingers, Hand, and Forearm*. By Allen B. Kanavel, M.D. illustrated with 133 engravings. Philadelphia and New York: Lea & Febiger. 1912. (1912). *The Boston Medical and Surgical Journal*, 166(20), 743–743. <https://doi.org/10.1056/nejm191205161662011>

To view all references, please refer to the online version of *Defining Med* by scanning the QR code on the cover page.



Dr Chung Sze-Ryn

*Associate Consultant, Department of Hand & Reconstructive Microsurgery,
Singapore General Hospital*

Dr Chung Sze-Ryn is an Associate Consultant in the Department of Hand & Reconstructive Microsurgery at Singapore General Hospital (SGH). She graduated from the Royal College of Surgeons, Ireland in 2011 and achieved her MRCS (Edinburgh) and MMed (Surgery) in 2013 and 2016 respectively.

Dr Chung completed her Hand Surgery Residency in 2020 and received the Outstanding Resident award in her final year. She is currently a clinical instructor at Duke-NUS Medical School and a clinical physician faculty member for the SingHealth Hand Surgery Residency Programme.

Dr Chung has been published in many distinguished peer-reviewed journals and was actively involved in the grant collaboration between the SGH Hand & Reconstructive Microsurgery Department and Nanyang Technology University (NTU-SACP grant). She recently won a grant of 150,000 SGD from the SingHealth Duke-NUS Academic Medical Centre to do animal research on the process of adhesion formation and its impact on clinical outcomes. Dr Chung has a special interest in reconstructive microsurgery of the extremities as well as wrist disorders.



Dr Farah Syahera binti Khairi

*Medical Officer, Department of Hand & Reconstructive Microsurgery,
Singapore General Hospital*

Dr Farah Syahera binti Khairi is a Medical Officer in the Department of Hand & Microsurgery at Singapore General Hospital. She graduated from the National University of Ireland, Galway in 2016. Throughout her journey as a junior doctor, she has done predominantly surgical postings. She has a special interest in hand surgery and is a hopeful candidate for the Residency Programme this year.



GP Appointment Hotline: **6326 6060**

GPs can scan the QR code for more information about the department.



A Multidisciplinary Approach to Treating Vascular Conditions

The SingHealth Duke-NUS Vascular Centre

ABOUT THE SINGHEALTH DUKE-NUS VASCULAR CENTRE

The SingHealth Duke-NUS Vascular Centre (SDVC) was established to bring together the multidisciplinary expertise of the vascular sub-specialties across SingHealth institutions – to offer integrated care and collaborate in research and education.

The multidisciplinary team consists of healthcare professionals from the following specialties:

- Vascular Surgery
- Interventional Radiology
- Interventional Nephrology
- Cardiothoracic Surgery
- Dermatology (Vascular Anomalies)
- Plastic Surgery
- Podiatry
- Wound Nursing

SURGICAL INNOVATION

One of the recent vascular surgery developments that the Centre is looking into is **complex aortic aneurysm treatment**. In the past, stent grafts were only used below the renal arteries in the abdomen. Today, custom-made devices are used to treat the whole aorta, including in the chest, abdomen and pelvis.

The Centre has also started to introduce the new technique of **endovascular creation of fistulas** to patients. Patients with chronic kidney disease require arteriovenous fistulas (AVFs) for dialysis access, usually in the arm. This technique will allow for the surgical creation of such fistula access – connecting the artery and the vein by stitching them together. The aim is to improve fistula maturation in appropriate candidates which represents a paradigm shift since the advent of surgical AVFs.

RESEARCH & BENCHMARKING

The Centre plans to consolidate the common research fields of Singapore General Hospital (SGH), Changi General Hospital (CGH) and Sengkang General Hospital (SKH), such as lower extremity revascularisation including endovascular treatment of the legs through ballooning and stents.

As part of the collective Centre, CGH and SKH will be joining SGH in participating in the Vascular Quality Initiative (VQI), a voluntary initiative by over 800 medical centres in North America to collect and share data on vascular care. This will also allow the three institutions to audit and benchmark the quality of our vascular care against that of other centres.

Given the number of patients with diabetic foot ulcers requiring amputation in Singapore, the SDVC is also focusing efforts on the setting up of an amputation database. Through this database, the centre will collate data to look into how to improve our diabetes care.



Our Services

Vascular surgery

- Aortic Surgery: Open and Minimally Invasive (Endovascular Aneurysm Repair [EVAR] / Thoracic Endovascular Aortic Repair [TEVAR])
- Carotid Surgery
- Lower Extremity Revascularisation, Including Angioplasty and Stenting
- Venous Surgery
- Arteriovenous Fistula Creation and Maintenance
- Miscellaneous Arterial and Venous Surgery

Vascular & interventional radiology

- Angiography
- Angioplasty (Balloon and Stent)
- Aortic Aneurysmal Repair (Stent Grafts)
- Arteriovenous Fistula Intervention, Including Angioplasty, Thrombolysis, and Embolisation
- Vascular Malformation Embolisation
- Central Venous Access Devices
- Inferior Vena Cava Filters, Thrombolysis of Deep Venous Thrombosis
- Ablation of Varicose Veins
- Trauma Embolisation

Interventional nephrology

- Renal Biopsy
- Placement of Tunneled and Non-Tunneled Haemodialysis Catheters
- Dialysis Access Interventions, Including Angioplasty and Thrombolysis
- Ultrasound-Guided Cannulation and Marking of Dialysis Access

Cardiothoracic surgery

- Aortic Surgery: Open and Minimally Invasive (EVAR/TEVAR)
- Aortic Root Reconstruction
- Aortic Arch Branch Vessel Reconstruction

Vascular anomalies

- Vascular Tumours (e.g., Infantile Haemangiomas, Kaposiform Haemangioendothelioma)
- Vascular Malformations (e.g., Venous, Lymphatic and Arteriovenous Malformations)
- Vascular Anomalies Syndromes (e.g., *PIK3CA*-Related Overgrowth Syndrome)

For GP referrals, please contact the SingHealth Duke-NUS Vascular Centre:

**Singapore General
Hospital**
6326 6060

**Changi General
Hospital**
6788 3003

**Sengkang General
Hospital**
6930 6000

**KK Women's and
Children's Hospital**
6294 4050

**National Heart
Centre Singapore**
6704 2222

Website: www.singhealth.com.sg/vascular-centre

Our Executive Committee

Head

Assoc Prof Chong Tze Tec

Head & Senior Consultant,
Dept of Vascular Surgery, SGH

Deputy Head

Assoc Prof Tay Kiang Hiong

Head & Senior Consultant,
Dept of Vascular and Interventional Radiology, SGH

Director, Education

Dr Ankur Patel

Senior Consultant,
Dept of Vascular and Interventional Radiology, SGH

Director, Research

Assoc Prof Tang Tjun Yip

Senior Consultant,
Dept of Vascular Surgery, SGH

Service Chief @ SGH

Assoc Prof Tan Chieh Suai

Head & Senior Consultant,
Dept of Renal Medicine, SGH

Service Chief @ CGH

Dr Darryl Lim

Consultant,
Dept of Surgery, CGH

Service Chief @ SKH

Assoc Prof Edward Choke Tieng Chek

Senior Consultant,
Dept of Surgery, SKH

Service Chief @ KKH

Clin Assoc Prof Mark Koh Jean Aan

Head & Senior Consultant,
Dept of Dermatology, KKH

Service Chief @ NHCS

Asst Prof Chao Tar Toong Victor

Senior Consultant,
Dept of Cardiothoracic Surgery, NHCS



Meeting the Unique Health Needs of Performing Artists

THE PERFORMING ARTS MEDICINE CLINIC

Dancers, musicians and vocalists are exceptional individuals with distinctive traits of both athletes and artists. These performing artists undergo intensive and extensive training for performances and competitions and are known to sustain overuse injuries.

Recognising their unique health needs specific to their art forms, Changi General Hospital (CGH) has launched the Performing Arts Medicine initiative and established the **Performing Arts Medicine Clinic (PAMC)** at the **Singapore Sport & Exercise Medicine Centre (SSMC) @ Novena**.

The PAMC aims to help these performing artists perform their best, and support their physical and mental wellness needs in a timely and individualised manner.

Located at Novena Medical Centre, the clinic **addresses the multifaceted health and wellness needs of performing artists** at all levels through comprehensive evaluation, injury prevention, treatment, rehabilitation, wellness and education on body mechanics and posture, while taking into consideration the intricate management required to address medical risks and expectations. Similar services are available at SSMC @ CGH.

A RISING NEED IN SINGAPORE

The interest in and demand for dance and music in Singapore is increasing. The number of members involved in performing arts interest groups has grown from 37,851 in 2015 to 50,180 in 2019, and about 8,700 performing arts activities were held each year on average from 2015 to 2019.

The prevalence of dance-related musculoskeletal injuries is as high as 84% in dancers,¹ and the lifetime prevalence of playing-related musculoskeletal disorders in musicians is reported to be between 62-93%.² For singers, laryngitis, vocal cord haemorrhages and polyps are common acute injuries.

A study conducted in Singapore found that dance-related injuries were present in more than half of the 365 dancers surveyed.³ Another pilot study done by CGH found that 9 in 10 first-year students studying

music at a tertiary level had musculoskeletal pain, and their social functioning and emotional well-being scores were found to be significantly lower than the general population.

Both studies revealed that many dancers and instrumentalists chose not to seek help, or took a rest from practice to allow recovery.



1. Jacobs CL, Cassidy JD, Côté P, Boyle E, Ramel E, Ammendolia C, Hartvigsen J, Schwartz I. Musculoskeletal Injury in Professional Dancers: Prevalence and Associated Factors: An International Cross-Sectional Study. *Clin J Sport Med*. 2017 Mar;27(2):153-160
2. Cruder C, Barbero M, Koufaki P, Soldini E, Gleeson N. Prevalence and associated factors of playing-related musculoskeletal disorders among music students in Europe. Baseline findings from the Risk of Music Students (RISMUS) longitudinal multicentre study. *PLoS One*. 2020 Dec 9;15(12):e0242660
3. Jason KK Chia. Survey Study on the Injury Patterns, Dance Practices and Health Seeking Behaviour amongst Dancers in Singapore. *Ann Acad Med Singap*. 2017 Feb;46(2):76-78.

Our Services

Led by sports physicians with an interest in dance medicine and instrumental medicine, together with an ear, nose and throat (ENT) surgeon with an interest in voice, the PAMC assesses and treats patients with the following conditions.

Musculoskeletal disorders

Dancers and instrumentalists are at higher risk of various musculoskeletal conditions that can affect bones, joints and soft tissues. They are prone to such problems due to repetitive movement and extreme bodily stress and strain.

Services include:

- Injury diagnosis and management
- Performer wellness and injury prevention
- Dancers' musculoskeletal screening
- Pointe-preparedness
- Physical therapy
- Sports massage

Voice disorders

Common injuries for vocalists include laryngitis, vocal cord haemorrhages, polyps and nodules. Vocalists may develop hoarseness and vocal fatigue that can interfere with the quality and endurance of the voice. A performer can also be affected by a variety of medical conditions which can include laryngitis, rhinitis and sinus disease, and gastroesophageal reflux disease.

Services include:

- Voice Clinic consultation
- Video-endoscopic and video stroboscopic examination of larynx
- Speech therapy

Anxiety and mental health issues

Our sports psychologist provides guidance in mind-body skills for peak performance, performance anxiety and eating disorders, and other supportive services.

The PAMC collaborates with a multidisciplinary team to coordinate care and provide access to the full range of specialties available at CGH.

The patient's care will be personalised and may include the following services:

- Diet and nutrition
- Hand occupational therapy
- Orthopaedics
- Physiotherapy
- Podiatry
- Psychology

How GPs Can Refer

For GP referrals, please contact SSMC@Novena at:
Tel: **6737 1000** | Website: www.ssmc.sg

Operating hours

Mon, Tue, Thu, Fri:
8.30am - 7pm

Wed:
8.30am - 9pm

Sat:
8.30am - 12.30pm

Closed on Sundays
and Public Holidays

Our Care Team

Dance Lead

Dr Mandy Zhang

Consultant, Dept of Sport & Exercise Medicine

Dr Zhang has a special interest in performing arts medicine, particularly dance medicine, and has completed a certification course on 'The Essentials of Performing Arts Medicine' under the Performing Arts Medicine Association (PAMA). She is the Chair of the Performing Arts Medicine special interest group under Sports Medicine Association Singapore and a member of the Professional Development Committee and Research Review Taskforce in the International Association of Dance Medicine and Science.

Musician Lead

Dr Lim Ang Tee

Consultant, Dept of Sport & Exercise Medicine

Dr Lim has a special interest in performance arts medicine, especially among musicians, and has completed a certification course on 'The Essentials of Performing Arts Medicine' under PAMA. He is working with the National University of Singapore Yong Siew Toh Conservatory of Music to educate students on injury prevention for playing-related musculoskeletal disorders.

Voice Lead

Clin Assoc Prof Peter Lu

Senior Consultant, Dept of Otorhinolaryngology
- Head & Neck Surgery

Professor Lu has been an ear, nose and throat specialist for over 25 years. He has a special interest in voice conditions affecting the vocal performer, especially in the effects of prolonged use of voice on vocal cords. He was involved in the setting up of the Changi General Hospital Voice Clinic, which offers a multidisciplinary approach towards evaluating and managing voice conditions.

Senior Consultants,

Dept of Sport & Exercise Medicine

Adj Assoc Prof Benedict Tan

Adj Assoc Prof Kelvin Chew

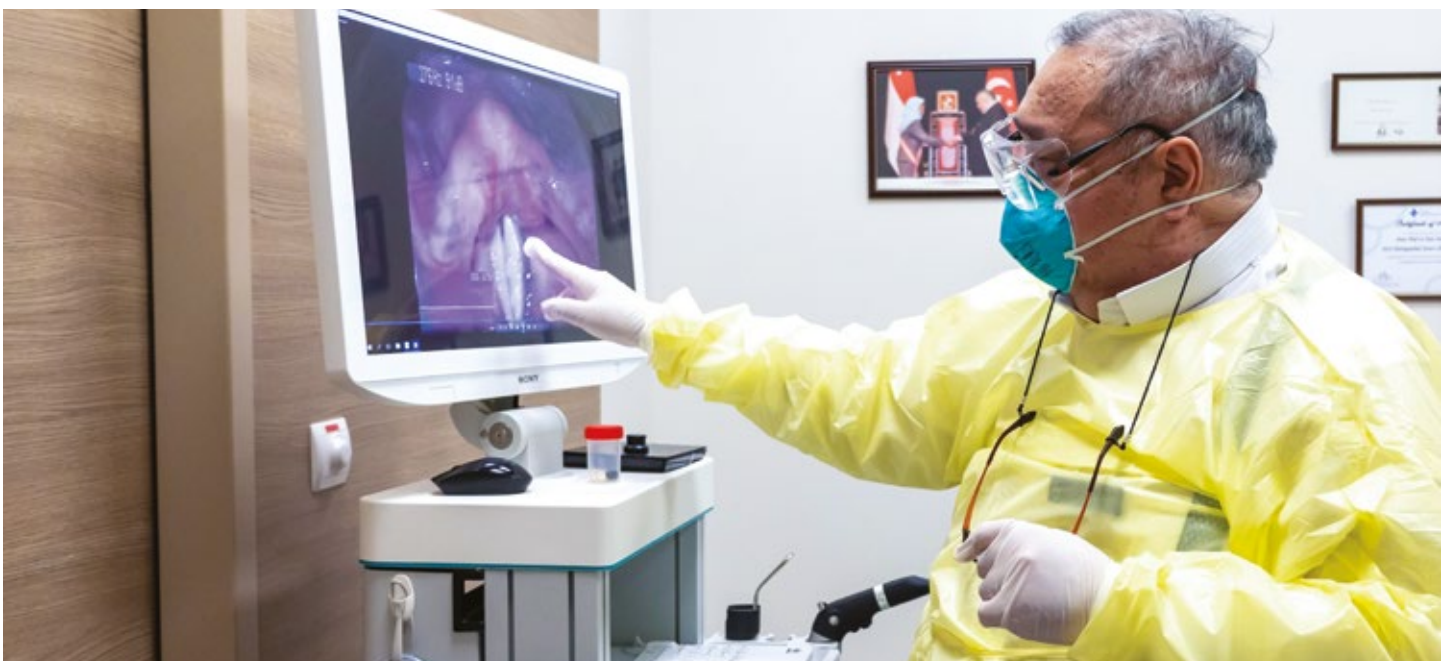
Adj Assoc Prof Roger Tian

Adj Asst Prof Ivy Lim

Principal Resident Physician,

Dept of Sport & Exercise Medicine

Dr Ng Chung Sien





Enhanced Access to Care for Early Pregnancy Issues

THE KKH EARLY PREGNANCY ASSESSMENT UNIT

To enhance and streamline access to care for women with early pregnancy issues, KK Women's and Children's Hospital (KKH) launched the Early Pregnancy Assessment Unit (EPAU) in June 2020.

Located within the Urgent O&G Centre (UOGC), EPAU offers dedicated, specialist management for early pregnancy-related issues such as bleeding or pain in pregnancy.

"EPAU allows for swifter specialist investigations into the woman's early pregnancy symptoms, enabling timely identification of life-threatening conditions such as ectopic pregnancy. Early detection also facilitates appropriate management and intervention at an earlier stage of pregnancy, and allows us to reassure the expectant mother and support her emotional well-being," shares Dr Rajeswari Kathirvel, Senior Consultant, Department of Obstetrics and Gynaecology, KKH, who leads the UOGC and EPAU.

Our Services

The new EPAU service enables patients with early pregnancy issues to schedule a consultation with an obstetrics and gynaecology specialist at a dedicated timeslot within 48 hours, at the same cost as a consultation at the KKH UOGC.

Who and How GPs Can Refer

EPAU is suitable for women with pregnancy issues during the first 16 weeks of pregnancy.

GPs can refer patients who are:

- Less than 16 weeks pregnant
- Experiencing mild abdominal pain or minimal vaginal bleeding
- Seeking early assessment/confirmation of pregnancy

For GP referrals, please contact the EPAU at:

KKH GP Hotline: 6692 2984

EPAU Hotline: 6394 1199 (Mondays to Fridays, 8.30am - 5.30pm)

Our Care Team



1. Dr Rajeswari Kathirvel

Head, UOGC and EPAU;
Senior Consultant,
Department of Obstetrics and Gynaecology

2. Dr Lily Kho

Consultant,
Department of Obstetrics and Gynaecology

3. Nurulain Binte Hassan

Nurse Clinician, Division of Nursing

4. Diana Binte Osman

Patient Service Associate, UOGC

5. Dr Carmen Tong

Associate Consultant,
Department of Obstetrics and Gynaecology

6. Ding Na

Assistant Director, Nursing, Division of Nursing

Note: Specialists from the Division of Obstetrics and Gynaecology at KKH provide care under EPAU on a rotational basis.



Integrated Care for High-Risk Pregnancies at New KKH STORK Centre


To meet the increasing need for holistic tertiary-level obstetric care, KK Women's and Children's Hospital (KKH) has launched the **one-STOP Obstetric high Risk (STORK) Centre** to provide integrated care for women with complex and high-risk pregnancies involving obstetric and medical specialists, nurses and allied health professionals.

This one-stop, integrated service facilitates collaborative and multidisciplinary care, which helps not only to optimise the preconception health of women with high-risk medical or obstetric conditions, but also to support these pregnant women throughout the different aspects and stages of their pregnancy journey.

Our Services		
Led by specialists from KKH's Department of Maternal Fetal Medicine, the new centre comprises eight clinics all located on the KKH campus.		
Clinic	Services	Referral Criteria (Non-exhaustive)
Obstetric High Risk Clinic (OHRC)	Consultant-led clinic for mothers with high-risk pregnancies	<ul style="list-style-type: none"> • Hypertensive disorders of pregnancy (e.g., pre-existing hypertension, gestational hypertension, preeclampsia) • Gestational diabetes mellitus on insulin • Compromised adverse outcomes in previous pregnancy <ul style="list-style-type: none"> – Stillbirth – Uterine rupture – History of severe preeclampsia – HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome – Eclampsia • Morbid obesity • Known or suspected case of placenta accreta • Anticipated complicated deliveries (e.g., large uterine fibroids in pregnancy)
Joint Diabetes in Pregnancy Clinic (OBSDM)	Combined clinic run jointly by a consultant endocrinologist or internal medicine specialist and a consultant maternal-fetal medicine specialist	<ul style="list-style-type: none"> • Pre-existing diabetes mellitus • Gestational diabetes mellitus on insulin with suboptimal control

Clinic	Services	Referral Criteria (Non-exhaustive)
Joint Medical Disorders in Pregnancy Clinic (OBSMED)	Combined clinic run jointly by an internal medicine specialist and a consultant maternal-fetal medicine specialist	<ul style="list-style-type: none"> • General medical disorders including: <ul style="list-style-type: none"> – Hypertension – Thyroid disorders – Neurological conditions (e.g., epilepsy, previous stroke) – Respiratory disease (e.g., poorly-controlled asthma) – Cardiac disease – Renal disease – Obstetric cholestasis – Rheumatological conditions – Malignancy in pregnancy
Joint Obstetric and Haematology Clinic (OBSHAEM)	Combined clinic run jointly by a consultant haematologist and a consultant maternal-fetal medicine specialist	<ul style="list-style-type: none"> • Previous history or current history of venous thromboembolic disease • Platelet disorders (e.g., immune thrombocytopenia purpura, gestational thrombocytopenia) • Complex anaemias (e.g., thalassemia major or intermedia) • Thrombophilia • Patients on long-term anticoagulation
Joint Obstetric and Dermatology Clinic (OBSSKIN)	Combined clinic run jointly by a consultant dermatologist and a consultant maternal-fetal medicine specialist	<ul style="list-style-type: none"> • Moderate-to-severe skin problems (e.g., psoriasis, pustular psoriasis, atopic dermatitis, immunobullous disease) requiring immunosuppressants or systemic therapy such as cyclosporin, prednisolone or biologics • Underlying autoimmune skin conditions (e.g., subacute lupus, anti-Ro/anti-La antibodies) • Pemphigoid gestationis, intrahepatic cholestasis of pregnancy (with refractory itch), atopic eruption of pregnancy (requiring phototherapy or immunosuppressants) • Women planning to start a family with skin problems requiring immunosuppressants or systemic therapy
Preterm Birth Clinic (OBSPRETERM)	Consultant-led clinic for mothers at increased risk for preterm birth	<ul style="list-style-type: none"> • Past history of cervical incompetence or cerclage • Current short cervix or cervical dilation on scan • History of spontaneous preterm birth or premature prelabour rupture of membranes (PPROM) before 34 weeks of gestation in previous pregnancy • History of mid-trimester pregnancy loss • Previous cervical surgery (e.g., cone biopsy) • Uterine malformations (e.g., uterine didelphys)
Twin Clinic (OBSTWIN)	Consultant-led clinic for mothers with multiple pregnancies	<ul style="list-style-type: none"> • Dichorionic diamniotic (DCDA) twin pregnancies • Monochorionic twin pregnancies • Higher-order multiple pregnancies

Clinic	Services	Referral Criteria (Non-exhaustive)
Obstetric Pre-Pregnancy Counselling Clinic (OBSPCC)	Consultant-led clinic for women with existing medical problems or previous adverse pregnancy outcomes, who require pre-pregnancy counselling and optimising before their next pregnancy	<ul style="list-style-type: none"> • Women with existing medical problems (e.g., rheumatological conditions, renal disease, cardiac disease) who require pre-pregnancy counselling and formulation of a pre-pregnancy plan prior to trying to conceive • Women with previous adverse obstetric outcomes or complications who are considering embarking on their next pregnancy

<h2>How GPs Can Refer</h2>	<p>GPs who would like to refer patients to the STORK Centre can scan the QR code to complete the referral form, and email it to STORK@kkh.com.sg.</p> <p>Urgent requests for patient referral can be made to the STORK Centre clinic coordinator at 6394 8901 during office hours (Mondays to Fridays, 8am - 5pm).</p>	
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Our Care Team

STORK Centre Lead

Dr Serene Thain
Consultant,
Department of Maternal Fetal Medicine

STORK Centre Advisors

Assoc Prof Tan Lay Kok
Head & Senior Consultant,
Department of Maternal Fetal Medicine

Dr Shephali Tagore
Senior Consultant,
Department of Maternal Fetal Medicine

STORK Centre Doctors, Department of Maternal Fetal Medicine

Dr Ann Margaret Wright
Head & Senior Consultant, Peripartum Unit

Dr Ilka Tan
Consultant

Dr Sim Wen Shan
Consultant

Dr Anju Bhatia
Staff Physician

Dr Grace Ng
Consultant

Dr Ryan Lee
Consultant

Dr Sharon Foo
Associate Consultant

STORK Centre Administrative Team

Zaiton Bte Soedar
Nurse Manager,
Division of Nursing

Christy Cao Yuhua
Senior Clinical Coordinator


Ng Bee Yen Karina Yolande
Clinical Coordinator

Specialist Promotions & Appointments

NEW APPOINTMENTS



Dr Lim Wei Inng Francesca Lorraine
Senior Consultant, Haematology;
Principal Lead, Education,
SingHealth Duke-NUS Cell Therapy Centre;
**Deputy Head, SingHealth Duke-NUS
Cell Therapy Centre**



Assoc Prof Tan Beng Hoi Agnes
Senior Consultant, Hand & Reconstructive
Microsurgery;
**Director (Clinical Quality & Governance)
Musculoskeletal Sciences ACP**



Assoc Prof Lim Eng Hoe Winston
Senior Consultant, Diagnostic Radiology;
Director, Post-Graduate Medical Institute;
**Vice Chair, Post Graduate Clinical
Education, College of Clinical Medicine;
Member, College of Clinical Medicine
Education Council**



Dr Sim Heng Chiak James
Senior Consultant, Microbiology;
**Laboratory, Pathology & Molecular
Medicine Services Lead,
EGH Planning Office, SingHealth**



Dr Lionel Cheng Tim-Ee
Senior Consultant, Diagnostic Radiology;
**Clinical Director (Artificial Intelligence),
Department of Future Health System**




Dr Damien Tan Meng Yew
Senior Consultant, Gastroenterology and
Hepatology;
Director, Endoscopy Centre;
Director (Medical Device and Apps
Development), Medicine ACP;
**Director, Clinical Innovation and
Technology Unit**




Dr Lee Kong Hwee
Consultant, Orthopaedic Surgery;
**Site Chief, SEM Service @ SGH Campus,
SingHealth Duke-NUS Sport & Exercise
Medicine Centre**


PROMOTIONS – SENIOR CONSULTANTS



Dr Lim Chee Yeong
Senior Consultant
Dept
Diagnostic Radiology




Dr Moey Hui Lin Tammy
Senior Consultant
Dept
Diagnostic Radiology




Dr Lee Phong Ching
Senior Consultant
Dept
Endocrinology



Dr Tay Wei Yi
Senior Consultant
Dept
Family Medicine &
Continuing Care



**Dr Lim Wei Inng
Francesca Lorraine**
Senior Consultant
Dept
Haematology



Dr Than Hein
Senior Consultant
Dept
Haematology

Specialist Promotions & Appointments

PROMOTIONS – SENIOR CONSULTANTS



Dr Teo Jin Yao
Senior Consultant
Dept
Hepato-pancreato-
biliary & Transplant
Surgery



Dr Indumathi Venkatachalam
Senior Consultant
Dept
Infection Prevention &
Epidemiology



Dr Chan Yuen Yue Candice
Senior Consultant
Dept
Infectious Diseases



Dr Chung Shimin, Jasmine
Senior Consultant
Dept
Infectious Diseases



Dr Arunachalam Sridhar
Senior Consultant
Dept
Neonatal &
Developmental Medicine



Dr Chen Xuanxuan
Senior Consultant
Dept
Pain Medicine



Dr Geoffrey Sithamparapillai Samuel
Senior Consultant
Dept
Rehabilitation Medicine



Dr Tan Yeow Leng
Senior Consultant
Dept
Rehabilitation Medicine



Dr Htay Htay
Senior Consultant
Dept
Renal Medicine



Dr Sobhana D/O Thangaraju
Senior Consultant
Dept
Renal Medicine



Dr Lim Chin Hong
Senior Consultant
Dept
Upper Gastrointestinal
& Bariatric Surgery



Dr Valerie Gan Huei Li
Senior Consultant
Dept
Urology



Dr Tay Kae Jack
Senior Consultant
Dept
Urology

PROMOTIONS – CONSULTANTS



Dr Au Yong Phui Sze
Consultant
Dept
Anaesthesiology



Dr Ng Von Vee
Consultant
Dept
Anaesthesiology



Dr Tay Zhi En, Amos
Consultant
Dept
Anatomical Pathology



Dr Julie Liana Binte Hamzah
Consultant
Dept
Breast Surgery



Dr Lai Chooi Yan, Anna Lois
Consultant
Dept
Diagnostic Radiology



Dr Lai Yusheng, Keefe
Consultant
Dept
Diagnostic Radiology



PROMOTIONS – CONSULTANTS



Dr Tan Eu Jin
Consultant
Dept
Diagnostic Radiology



Dr Jyothirmayi Velaga
Consultant
Dept
Diagnostic Radiology



Dr Vora Bimal Mayur Kumar
Consultant
Dept
Diagnostic Radiology



Dr Wen Wei, David
Consultant
Dept
Diagnostic Radiology



Dr Karande Gita Yashwantrao
Consultant
Dept
Diagnostic Radiology



Dr Tess Lin Teo
Consultant
Dept
Emergency Medicine



Dr Tian Wei Cheng, Brian Anthony
Consultant
Dept
General Surgery



Dr Lawrence Ng Cheng Kiat
Consultant
Dept
Haematology



Dr Lim Qian Ru, Rebecca
Consultant
Dept
Hand & Reconstructive Microsurgery



Dr Chan Fu Zi, Yvonne
Consultant
Dept
Infectious Diseases



Dr Thien Siew Yee
Consultant
Dept
Infectious Diseases



Dr Hsieh Yi Chen
Consultant
Dept
Internal Medicine



Dr Shaikh Abdul Matin B S A M Mattar
Consultant
Dept
Internal Medicine



Dr Suraya Binti Zainul Abidin
Consultant
Dept
Orthopaedic Surgery



Dr Chia Zi Yang
Consultant
Dept
Orthopaedic Surgery



Dr Liow Ming Han, Lincoln
Consultant
Dept
Orthopaedic Surgery



Dr Ou Yang Youheng
Consultant
Dept
Orthopaedic Surgery



Dr Tay Kae Sian
Consultant
Dept
Orthopaedic Surgery



Dr Kenny Tay Xian Khing
Consultant
Dept
Orthopaedic Surgery



Dr Woo Yew Lok
Consultant
Dept
Orthopaedic Surgery



Dr Ng Jia Hui
Consultant
Dept
Otorhinolaryngology - Head & Neck Surgery

Specialist Promotions & Appointments

PROMOTIONS – CONSULTANTS



Dr Lin Xufeng
Consultant
Dept
Pain Medicine



Dr Tan Hui Zhuang
Consultant
Dept
Renal Medicine



**Dr Tng Ren Kwang,
Alvin**
Consultant
Dept
Renal Medicine



Dr Chew Si Yuan
Consultant
Dept
Respiratory & Critical
Care Medicine



Dr Kam Li Wei, Michelle
Consultant
Dept
Respiratory & Critical
Care Medicine



Dr Tan Yi Hern
Consultant
Dept
Respiratory & Critical
Care Medicine



Dr Wong Si Min, Jolene
Consultant
Dept
Sarcoma, Peritoneal &
Rare Tumours



Dr Lee Zhen Jin
Consultant
Dept
Upper Gastrointestinal
& Bariatric Surgery



**Dr Lye Jian Ying,
Tiffany**
Consultant
Dept
Upper Gastrointestinal
& Bariatric Surgery



**Dr Edwin Jonathan
Aslim**
Consultant
Dept
Urology



Changi
General Hospital
SingHealth

Appointments: 6788 3003 | Email: cgh.com.sg

NEW APPOINTMENT



**Dr Sriranganathan
Melonie Kannamma**
Head & Consultant
Division of
Rheumatology

PROMOTIONS – SENIOR CONSULTANTS



Dr Ang Peck Har
Senior Consultant
Dept
Accident & Emergency



Dr Thng Shin Ying
Senior Consultant
Dept
Accident & Emergency



**Dr Kiew Sheng Chuu
Anne**
Senior Consultant
Dept
Anaesthesia & Surgical
Intensive Care



PROMOTIONS – SENIOR CONSULTANTS



Dr Ng Xiang Long
Louis

Senior Consultant

Dept
Anaesthesia & Surgical
Intensive Care



Dr Lee Wai Peng

Senior Consultant

Division of Breast
Surgery



Dr See Jia Hao Jason

Senior Consultant

Dept
Cardiology



Dr Yeo Colin

Senior Consultant

Dept
Cardiology



Dr Ratna Rajaratnam

Senior Consultant

Dept
Dermatology



Dr Liew Jin Yee
Charlene

Senior Consultant

Dept
Diagnostic Radiology



Dr Linsey Utami Gani

Senior Consultant

Dept
Endocrinology



Dr Gokhale Roshni
Sadashiv

Senior Consultant

Dept
General Medicine



Dr Salim Murtaza
Euffali Anjarwalla

Senior Consultant

Dept
Laboratory Medicine



Dr Kuo Chung Liang

Senior Consultant

Dept
Orthopaedic Surgery



Dr Wee Tze Chao

Senior Consultant

Dept
Rehabilitation Medicine



Dr Choo Xue Ning

Senior Consultant

Dept
Respiratory & Critical
Care Medicine



Dr Lim Ivy

Senior Consultant

Dept
Sport & Exercise
Medicine



Dr Ramesh Wijaya

Senior Consultant

Dept
Surgery

PROMOTIONS – CONSULTANTS



Dr Li Weiling, Lydia

Consultant

Dept
Anaesthesia & Surgical
Intensive Care



Dr Hing Jun Xian

Consultant

Division of Breast
Surgery



Dr See Qin Yong

Consultant

Dept
Care & Health
Integration



Dr Tan Chee Wei
(Chen Zhiwei)

Consultant

Dept
Care & Health
Integration



Dr Lee Shu Yi, Sonia

Consultant

Dept
Diagnostic Radiology



Dr Lim Yurui David

Consultant

Dept
Diagnostic Radiology

Specialist Promotions & Appointments

PROMOTIONS – CONSULTANTS



Dr Shi Haiyuan
Consultant
Dept
Diagnostic Radiology



Dr Hatta Santoso Ong
Consultant
Dept
Psychological Medicine



Dr Chew Wui Mei
Consultant
Dept
Respiratory & Critical
Care Medicine



**Dr Zhang Jijia,
Mandy**
Consultant
Dept
Sport & Exercise
Medicine



Appointments: 6930 6000 | Email: appointments@skh.com.sg

NEW APPOINTMENTS



Dr Lim Wan Yen
*Deputy Director,
Perioperative Care
Coordination, Safety
and Quality;
Consultant*



Dr Lin Cui Li
*Head, Gastroenterology
& Hepatology Service;
Senior Consultant,
Gastroenterology*
Dept
General Medicine



Dr Iris Rawtaer
Head & Consultant
Dept
Psychiatry

PROMOTIONS – SENIOR CONSULTANTS



**Dr Chiam Pei Sze
Priscilla**
*Senior Consultant,
Endocrinology*
Dept
General Medicine



**Dr Sueziani Binte
Zainudin**
*Senior Consultant,
Endocrinology*
Dept
General Medicine



**Dr Tan Han Ying
Jessica**
*Senior Consultant,
Respiratory Medicine*
Dept
General Medicine



Dr Ho Chi Long
Senior Consultant
Dept
Radiology



PROMOTIONS – CONSULTANTS



**Dr Chan Chee Yun,
Eunice**
Consultant
Dept
Emergency Medicine



**Dr Chinmaya Shrikant
Joshi**
Consultant
Dept
Emergency Medicine



**Dr Tan Chieh Ling,
Jacqueline**
Consultant
Dept
Emergency Medicine



Dr Chua Jia Min
*Consultant,
Endocrinology*
Dept
General Medicine



**Dr Marianne Anastasia
De Roza**
*Consultant,
Gastroenterology*
Dept
General Medicine



Dr Ng Yi Kang
*Consultant,
Gastroenterology*
Dept
General Medicine



Dr Tey Tze Tong
*Consultant,
Gastroenterology*
Dept
General Medicine



**Dr Wang Tzong-Yee
Colin**
Consultant
Dept
Orthopaedic Surgery



Dr Chua Jian Kai Andy
Consultant
Dept
Otorhinolaryngology -
Head & Neck Surgery



Dr Seow Su Yin
Consultant
Dept
Psychiatry



**Dr Kok Shi Xian,
Shawn**
Consultant
Dept
Radiology



Dr Li Junsiguan
Consultant
Dept
Radiology



Dr Aftab Syed
Consultant
Dept
Radiology

APPOINTMENT – ASSOCIATE CONSULTANT



Christina Ng Hui Lee
Associate Consultant
Dept
Otorhinolaryngology -
Head & Neck Surgery

Specialist Promotions & Appointments



KK Women's and
Children's Hospital
SingHealth

Appointments: 6692 2984 | Email: centralappt@kkh.com.sg

NEW APPOINTMENTS



Dr Loh Hong Pheng Amos
*Deputy Chairman,
Division of Surgery;
Senior Consultant*
Dept
Paediatric Surgery



Dr Lim Hua Ling Evangeline
*Deputy Head &
Senior Consultant*
Dept
Paediatric Anaesthesia

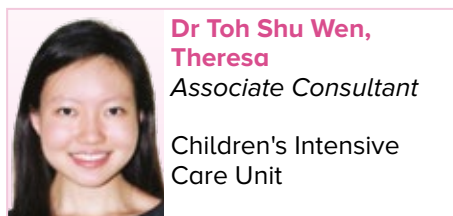


Dr Tan Vic Khi June
*Director, Antenatal
Diagnostic Centre /
Antenatal Monitoring
Clinic;
Senior Consultant*
Dept
Maternal Fetal Medicine

APPOINTMENTS – ASSOCIATE CONSULTANTS



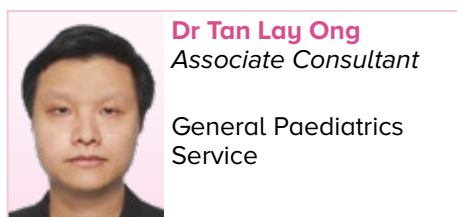
Dr Li Yunnan, Kenneth
Associate Consultant
Dept
Child Development



Dr Toh Shu Wen, Theresa
Associate Consultant
Children's Intensive
Care Unit



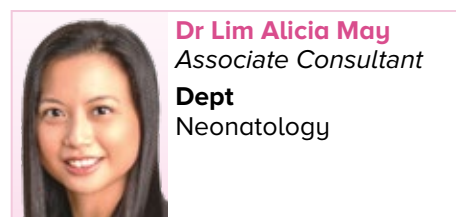
Dr Liang Wei Hao, Kevin
Associate Consultant
General Paediatrics
Service



Dr Tan Lay Ong
Associate Consultant
General Paediatrics
Service



Dr Yap Xin Yi Amanda
Associate Consultant
Haematology /
Oncology Service



Dr Lim Alicia May
Associate Consultant
Dept
Neonatology



Dr Tham Shu Qi
Associate Consultant
Dept
Paediatric Anaesthesia



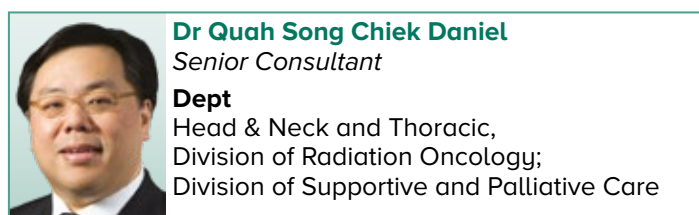
National Cancer
Centre Singapore
SingHealth

Appointments: 6436 8288 | Email: gpnetwork@nccs.com.sg

PROMOTIONS – SENIOR CONSULTANTS



Clin Asst Prof Kiattisa Sommat
Senior Consultant
Dept
Breast and Gynaecology;
Head & Neck and Thoracic,
Division of Radiation Oncology



Dr Quah Song Chiek Daniel
Senior Consultant
Dept
Head & Neck and Thoracic,
Division of Radiation Oncology;
Division of Supportive and Palliative Care



PROMOTIONS – SENIOR CONSULTANTS



Clin Asst Prof Tiffany Priyanthi Henedige
Senior Consultant

Division of Oncologic Imaging



Dr Ong Wah Ying
Senior Consultant

Division of Supportive & Palliative Care

PROMOTIONS – CONSULTANTS



Dr Tan Ying Cong Ryan Shea
Consultant

Dept
Breast and Gynaecology,
Division of Medical Oncology



Dr Chan Wai Kay Johan
Consultant

Dept
Lung, Head & Neck and Genitourinary,
Division of Medical Oncology



Dr Saw Pei Li Stephanie
Consultant

Dept
Lung, Head & Neck and Genitourinary,
Division of Medical Oncology



Dr Teh Yi Lin
Consultant

Dept
Lung, Head & Neck and Genitourinary,
Division of Medical Oncology



Asst Prof Yang Shiwen Valerie
Consultant

Dept
Lymphoma and Sarcoma,
Division of Medical Oncology



Dr Chiang Jianbang
Consultant

Division of Medical Oncology



Dr Han Shuting
Consultant

Division of Medical Oncology



Dr Chan Wan Ying
Consultant

Division of Oncologic Imaging



Dr Ooi Su Kai Gideon
Consultant

Division of Oncologic Imaging



Dr Zhuang Qingyuan
Consultant

Division of Supportive & Palliative Care

Specialist Promotions & Appointments



Appointments: 6324 8798 | Email: appointment@ndcs.com.sg

PROMOTIONS – CONSULTANTS



Dr Qian Li
Consultant
Dept
Orthodontics



Dr Chew Qin'An Amelia Anya
Consultant
Dept
Restorative Dentistry
Sub-specialty
Prosthodontics

APPOINTMENTS – ASSOCIATE CONSULTANTS



Dr Lee Qi Qi
Associate Consultant
Dept
Oral & Maxillofacial Surgery



Dr Thio Yan Li, Nicole Agnes
Associate Consultant
Dept
Oral & Maxillofacial Surgery



Dr Hu Cidong
Associate Consultant
Dept
Restorative Dentistry
Sub-specialty
Periodontics



Dr Phang Zi Ying
Associate Consultant
Dept
Restorative Dentistry
Sub-specialty
Prosthodontics



Dr Quek Hui Qi, Seralyn
Associate Consultant
Dept
Restorative Dentistry
Sub-specialty
Prosthodontics



Appointments: 6704 2222 | Email: central.appt@nhcs.com.sg

APPOINTMENTS – ASSOCIATE CONSULTANTS



Dr Kui Swee Leng Michelle
Associate Consultant
Dept
Cardiology



Dr Teo Hooi Khee
Associate Consultant
Dept
Cardiology
Sub-specialties
Heart Failure, Electrophysiology & Pacing



NEW APPOINTMENTS


**Prof Lo Yew Long**
*Deputy Medical Director
(Medical Affairs & Quality Management);
Senior Consultant*
Dept
Neurology

**Assoc Prof Deidre Anne De Silva**
*Director, Patient Safety & Clinical Quality;
Head & Senior Consultant*
Dept
Neurology, NNI@SGH Campus

APPOINTMENTS – ASSOCIATE CONSULTANTS


**Dr Chiew Yi Rong**
Associate Consultant
Dept
Neurology

**Dr Chuang Ding Fang**
Associate Consultant
Dept
Neurology

**Dr Sarah Hasnor Binti
Abu Hassan**
Associate Consultant
Dept
Neurology


**Dr Kong Yongyao**
Associate Consultant
Dept
Neurology

**Dr Lai Yexian,
Jonathan**
Associate Consultant
Dept
Neurology


**Dr Ng Chai Ching**
Associate Consultant
Dept
Neurology


**Dr Ong Chiew Sern**
Associate Consultant
Dept
Neurology

**Dr Sumit Kumar Sonu**
Associate Consultant
Dept
Neurology

**Dr Ang Ya Lyn
Samantha**
Associate Consultant
Dept
Neurosurgery

PROMOTIONS – SENIOR CONSULTANTS

**Dr Chew Chee
Yen Annabel**
Senior Consultant
Dept
Glaucoma
Sub-specialty
Ophthalmology

**Dr Jayant
Venkatramani Iyer**
Senior Consultant
Dept
Glaucoma
Sub-specialty
Ophthalmology

**Dr Grace Wu Yuen Man**
Senior Consultant
Dept
Paediatric
Ophthalmology &
Adult Strabismus
Sub-specialty
Ophthalmology

Specialist Promotions & Appointments

PROMOTIONS – CONSULTANTS



Dr Foo Li Lian

Consultant

Dept

Cataract & Comprehensive Ophthalmology

Sub-specialty

Ophthalmology



Dr Sim Khung Peng, Shaun Sebastian

Consultant

Dept

Cataract & Comprehensive Ophthalmology

Sub-specialty

Ophthalmology



Dr Kiew Sieh Yeap

Consultant

Dept

Glaucoma

Sub-specialty

Ophthalmology



Dr Low Jin Rong

Consultant

Dept

Glaucoma

Sub-specialty

Ophthalmology



Dr Ng Si Rui

Consultant

Dept

Glaucoma

Sub-specialty

Ophthalmology



Dr Yau Wen Leng Christine

Consultant

Dept

Neuro-Ophthalmology

Sub-specialty

Ophthalmology

APPOINTMENT – ASSOCIATE CONSULTANT



Dr Sudarshan Seshasai

Associate Consultant

Dept

Cataract & Comprehensive Ophthalmology

Sub-specialty

Ophthalmology



Polyclinics
SingHealth

NEW APPOINTMENTS



Dr Adrian Ee Guan Liang

*Senior Advisor, SingHealth,
SingHealth Board of Advisors;
Director Medical,
Correctional Medicine for Changi Medical
Facility (Prisons Changi Medical Centre)*



Dr David Ng Chee Chin

*Chief Executive Officer,
SingHealth Polyclinics;
Academic Chair, SingHealth Duke-NUS
Family Medicine ACP*



Dr Derek Tse Wan Lung

*Deputy Chief Executive Officer,
SingHealth Polyclinics*

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If you are a qualified doctor, a challenging career awaits you at SingHealth. We seek suitably qualified candidates to join us as:

- SENIOR CONSULTANTS/CONSULTANTS/ASSOCIATE CONSULTANTS
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- STAFF REGISTRARS/SERVICE REGISTRARS

Interested applicants are to email your CV with full personal particulars, educational and professional qualifications (including housemanship details), career history, present and expected salary, names of at least two professional references, contact numbers and email address together with a non-returnable photograph.

Please email your CV to the respective institutions' email addresses/online career portals with the Reference Number DM2201.



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With 42 clinical specialties, a network of 4 Hospitals, 5 National Specialty Centres, 8 Polyclinics and 3 Community Hospitals, it delivers comprehensive, multidisciplinary and integrated care.

Singapore General Hospital

Departments seeking:

Resident Physicians and Staff Registrars

- Anaesthesiology
- Diagnostic Radiology
- Medical disciplines such as Emergency Medicine, Haematology, Infectious Diseases, Renal Medicine, Gastroenterology
- Surgical disciplines such as General Surgery, ENT-HNS, O&G, Breast, SPRinT, Colorectal, Vascular Surgery, Urology, Orthopaedics, Hand and Plastic

Associate Consultants/Consultants

- Surgical Oncology (Sarcoma, Peritoneal and Rare Tumours)
- Clinical Epidemiologist

Website: www.sgh.com.sg

Career Portal: www.sgh.com.sg/careers

Email: careers.medical@sgh.com.sg

Changi General Hospital

Departments seeking Resident Physicians and Staff Registrars

- Anaesthesia & Surgical Intensive Care
- Accident & Emergency
- Diagnostic Radiology
- General Medicine
- Geriatric Medicine
- Surgery
- Ophthalmology
- Orthopaedic Surgery
- Otorhinolaryngology - Head & Neck Surgery

Associate Consultants

- Anaesthesia & Surgical Intensive Care
- Gastroenterology & Hepatology
- Orthopaedic Surgery
- Renal Medicine
- Surgery

Website: www.cgh.com.sg

Email: medical_hr@cgh.com.sg

Sengkang General Hospital

Departments seeking:

Resident Physicians and Staff Registrars

- Anaesthesiology
- Cardiology
- Emergency Medicine
- Surgery
- General Medicine (with interest in Dermatology and Palliative Medicine)
- Intensive Care Medicine
- Orthopaedic Surgery (with interest in Hand Surgery and Orthopaedic Surgery)
- Otorhinolaryngology - Head & Neck Surgery
- Plastic, Reconstructive & Aesthetic Surgery Service
- Urology

Senior Consultant, Consultant, Associate Consultant

- Intensive Care Medicine
- Radiology
- Pathology
- Urology

Website: www.skh.com.sg

Career Portal: www.skh.com.sg/careers/Pages/careers.aspx

Email: careers@skh.com.sg

KK Women's and Children's Hospital

Senior Consultants/Consultants/ Associate Consultants

- Pathology & Laboratory Medicine (Gynaecologic & Breast Pathologist, Microbiologist and Chemical Pathologist)

Associate Consultants/Consultants

- Dermatology

Senior Consultants/Consultants/ Associate Consultants

- Diagnostic & Interventional Imaging

Staff Registrars

- Child Development
- Diagnostic & Interventional Imaging
- Paediatric Surgery

Family Physician

- Family Medicine

Resident Physicians

- Diagnostic & Interventional Imaging
- Emergency Medicine
- Ophthalmology Service
- Orthopaedic Surgery
- Otolaryngology
- Paediatric Surgery
- Psychological Medicine
- Women's Anaesthesia

Website: www.kkh.com.sg

Email: medical.hr@kkh.com.sg

National Cancer Centre Singapore

Departments seeking Resident Physicians

- Breast Surgery
- SingHealth Investigational Medicine Unit (IMU)

Website: www.nccs.com.sg

Email: HR-Clinical@nccs.com.sg

National Heart Centre Singapore

Departments seeking Resident Physicians

- Cardiology
- Cardiothoracic Surgery

Website: www.nhcs.com.sg

Email: tim.bee.kuan@nhcs.com.sg

National Neuroscience Institute

Departments seeking Resident Physicians and Service Registrars

- Neurology
- Neuroradiology
- Neurosurgery

Website: www.nni.com.sg

Email: nni_hr@nni.com.sg

Singapore National Eye Centre

Department seeking

- Resident Physician, Ophthalmology
- Staff Registrar, Ophthalmology

For more information, please visit the Career Opportunities section on the Singapore National Eye Centre website.

Website: www.snec.com.sg

Email: recruitment@snec.com.sg

SingHealth Community Hospitals

(Sengkang Community Hospital, Outram Community Hospital and Bright Vision Hospital)

Department seeking:

Staff Registrars, Resident Physicians

- Family Medicine

Website: <http://www.singhealthch.com.sg/>

Career Portal: www.singhealth.com.sg/SCH/careers/Pages/Careers.aspx

Email: schrecruitment@singhealthch.com.sg

Paediatric Integrated Neuro-Rehabilitation Service (PINS) Education Series



KK Women's and
Children's Hospital
SingHealth

Join us for a deep dive into a multidisciplinary approach to comprehensive care for children with long-term neurological conditions.

The Paediatric Integrated Neuro-rehabilitation Service (PINS) is an integrated, comprehensive paediatric neuro-rehabilitation programme that aims to maximise the child's functional abilities.

Topics will include common manifestations following a neurological condition or brain injury – **seizures** and **cognitive impairment**.

Date

19 and 20 January 2022
(Wednesday and Thursday)

Time

12pm to 1.30pm

Hosted via
Zoom Webinar

CME and SNB-CPE
points will be awarded

Free
admission



Scan the QR code to register.

Slots will be allocated on a first-come, first-served basis.
For enquiries, please email to pins.rehab@kkh.com.sg.





Changi
General Hospital
SingHealth

Management of Erectile Dysfunction, Testosterone Deficiency and Benign Prostatic Hyperplasia in Primary Care

Join us as our panel of experts share updates on the approaches to treatment for erectile dysfunction, testosterone deficiency & benign prostatic hyperplasia (BPH) in the primary care setting.

Topics include:

- Optimising treatment for patients with erectile dysfunction
- Identifying and treating the testosterone-deficient patient
- The approach to male lower urinary tract symptoms (LUTS) and BPH
- Surgical treatment for BPH

Date	Time	Hosted via	2 CME
15 January 2022 (Saturday)	2pm to 4pm	Zoom Webinar	points awarded
Free admission			

Scan the
QR code
to register.



For enquiries, please contact

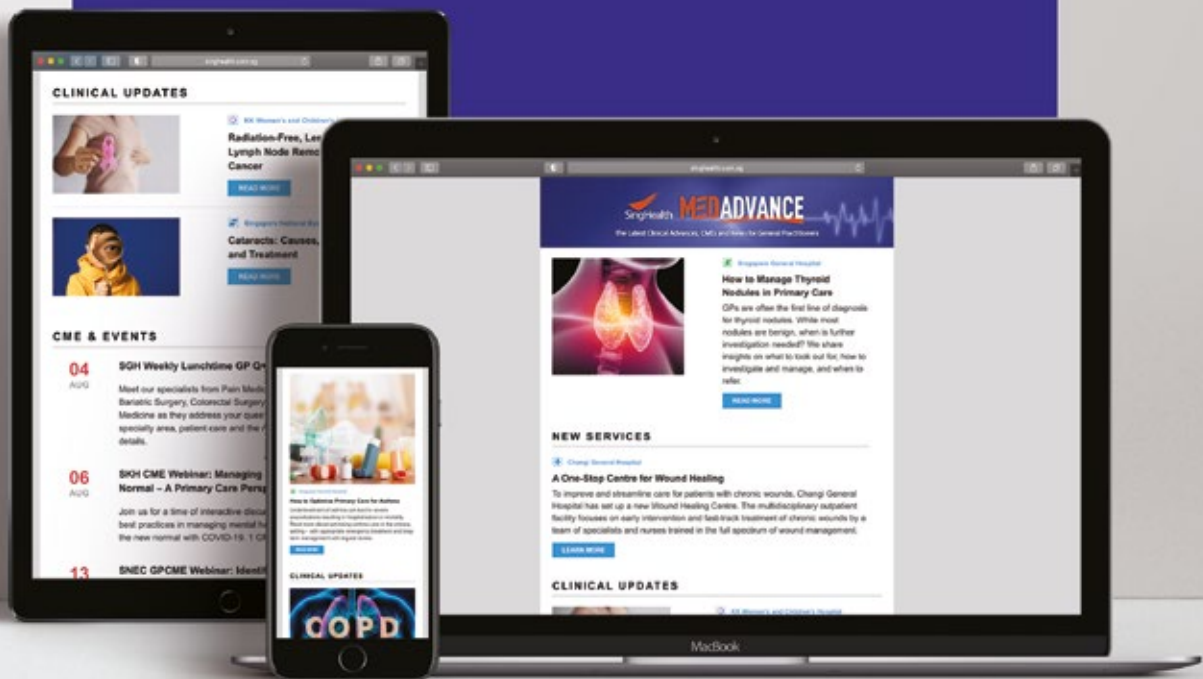
Ms Nurazila Binti Zakaria at nurazila_zakaria@cgh.com.sg, or
Mr Aydan Luo at aydan.luo.y.s@singhealth.com.sg.

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HOTLINES



GP Fast Track Appointment Hotlines

 Singapore General Hospital 6326 6060	 KK Women's and Children's Hospital 6692 2984	 National Heart Centre Singapore 6704 2222
 Changi General Hospital 6788 3003	 National Cancer Centre Singapore 6436 8288	 National Neuroscience Institute 6330 6363
 Sengkang General Hospital 6930 6000	 National Dental Centre Singapore 6324 8798	 Singapore National Eye Centre 6322 9399

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