The Royal Australian and New Zealand College of Radiologists®

Stakeholder Consultation Paper: Recognising Interventional Neuroradiology as a field of specialty practice within Radiology in Australia

About RANZCR

The Royal Australian and New Zealand College of Radiologists (RANZCR) is committed to improving health outcomes for all, by educating and supporting clinical radiologists and radiation oncologists. RANZCR is dedicated to setting standards, professional training, assessment and accreditation, and advocating access to quality care in both professions to create healthier communities.

RANZCR creates a positive impact by driving change, focusing on the professional development of its members and advancing best practice health policy and advocacy, to enable better patient outcomes.

RANZCR members are critical to health services: radiation oncology is a vital component in the treatment of cancer; clinical radiology is central to the diagnosis and treatment of disease and injury, and in providing minimally invasive medical procedures and treatments.

Accredited by the Australian Medical Council and the Medical Council of New Zealand, the College is responsible for establishing and managing training programs for specialist doctors to be admitted into the professions of clinical radiology and radiation oncology, the assessment of overseas-trained specialists to enter these professions, and the continuing professional development of its members.

RANZCR Is Inviting your Feedback

The Royal Australian and New Zealand College of Radiologists (RANZCR) is applying for recognition of Interventional Neuroradiology as a separate field of specialty practice within the specialty of Radiology in Australia.

Fields of specialty practice define specialty medical health services in Australia, for example, Cardiology and Rheumatology are recognised Physician fields of specialty practice while Neurosurgery and Urology are fields of specialty practice within Surgery. Existing fields of specialty practice within Radiology include Diagnostic Ultrasound, Diagnostic Radiology and Nuclear Medicine.

Currently there is no recognition of Interventional Neuroradiology by the Medical Board of Australia (MBA) and the Australian Health Practitioner Regulation Agency (AHPRA). This inadvertently restricts patient access to these specialist services and reduces visibility to the wider community, which limits patient choice and the ability to consistently offer state of the art minimally invasive technologies that have been proven to improve patient health outcomes. The flow on effects of the current status means that these services are not reliably included, nor considered, in health service and infrastructure decisions made by various health departments and other relevant authorities. This impedes the ability to plan flexible health services that meet community demands and expectations. Australian health consumers expect a health system that offers contemporary and future focused technologies and procedures that are not only minimally invasive to the patient but also have a low impact on their daily activities and lives.

RANZCR wishes to formalise recognition of specialist practice for Interventional Neuroradiology to ensure equitable patient access to Interventional Neuroradiology services and its workforce in metropolitan, rural, regional and remote locations. Designating Interventional Neuroradiology as a field of specialty practice within the specialty of Radiology will not impact the scope of practice for other medical specialties.

As a key stakeholder, we are seeking your comments and feedback to support the submission of an application from RANZCR to the Medical Board of Australia to recognise Interventional Neuroradiology as a field of specialty practice within Radiology (see Appendix A). All feedback gathered during this process will be fully considered and inform the College's application.

About Interventional Neuroradiology

Interventional Neuroradiology is an image-guided specialty of clinical radiology that diagnoses, manages and treats patients with acquired or congenital diseases of the nervous system including the brain, head and neck, spinal cord and vertebral column. Radiologists who practice Interventional Neuroradiology possess a distinct and unique body of specialist knowledge and skills over and above those required for generalist diagnostic radiology practice and separate from other existing specialties or fields of specialty practice.

Like most specialties Interventional Neuroradiology is a critical part of multidisciplinary team environments. Interventional Neuroradiologists work closely with a range of other medical specialties including neurology, neurosurgery, anaesthetics, intensive care, ear nose and throat surgery, maxillofacial surgery, plastic surgery, spinal surgery and vascular surgery. Interventional Neuroradiology specialists are also supported by dedicated medical imaging technologists and nurses who have completed additional training to deliver specialist care to patients.

Interventional Neuroradiologists utilise a range of image-guided technologies such as digital subtraction angiography, computed tomography, ultrasound and magnetic resonance imaging often with advanced post processed imaging to diagnose and treat neurological pathologies in adults, children and babies.

Why Specialty Recognition?

RANZCR's application to formalise Interventional Neuroradiology as an AHPRA and MBA recognised field of specialty within Radiology will benefit patients, health practitioners and the broader health system in the following ways:

- Improve patient access to a wider range of treatment options that deliver high-value care and beneficial health outcomes, achieved through greater visibility and inclusion of Interventional Neuroradiology into Australia's healthcare system.
- Reflect the specialist role of Interventional Neuroradiologists in delivering care to patients, within a multidisciplinary hospital environment, which is presently opaque to the general public.
- Raise standards of practice with a requirement for all Interventional Neuroradiologists to complete an accredited standardised training pathway to comply with the high standards of care delivery and meet the expectations of patients, and the broader health system.
- Ensure the consistent provision of essential Interventional Neuroradiology services (elective, emergency inpatient and outpatient services), as part of a multidisciplinary team delivering specialist care to patient.
- Recognition will result in inclusion of Interventional Neuroradiology as a domain in health and consumer information technology systems, making identification of these services easier for consumers and referrers.
- Will enable systematic inclusion of Interventional Neuroradiology services in health service planning and infrastructure to meet expectations for metropolitan, rural, regional and remote communities.
- Enhance Interventional Neuroradiology's ability to advocate for Neuroscience research and resources for the betterment of the practitioner workforce and patient care.
- Consumers and patients will be assured they are receiving care from registered health practitioners who have the knowledge, skills and professional attributes necessary to offer high quality specialist medical services.

The Value and Health Benefits of Interventional Neuroradiology

The value of Interventional Neuroradiology to individual patient care and the healthcare system more broadly is apparent through the range of endovascular and percutaneous treatment options available for neurological conditions that are not accessible surgically;[1,2,3,4,5,6] or where the benefits of minimally invasive interventional neuroradiology techniques lead to favourable health outcomes.

Interventional Neuroradiology procedures can be performed in elective, emergency inpatient and outpatient settings – typically resulting in:

- Fewer complications associated with treatment[7,8,9,10,11,12,13]
- Lower risk of postoperative infection[14,15,16,17,18,19]
- Shorter hospital stays[720,21,22,23,24,25,26,27,28]
- Less likely to need rehabilitation[29,30,31,32,33,34,35]
- Quicker return to the patient's normal life[36,37,38,39,40,41,42]
- Reduced morbidity [43,44,45,46,47] and mortality[48,49,50,51,52,53,54,55,56,57,58,59,60,61,62]
- Cost effective treatments[63,64,65,66,67,68]

In addition to these highly beneficial attributes, a number of Interventional Neuroradiology procedures has evolved to become the standard of care for treating a number of conditions, such as Mechanical Thrombectomy[69],[70] for the treatment of large vessel occlusion acute ischaemic stroke. Interventional Neuroradiology is also the first line treatment option for dural arteriovenous and carotid cavernous fistula.[71,72,73,74] (see Appendix B).

The benefits of image-guided interventions delivered by Interventional Neuroradiologists were also apparent during the COVID-19 pandemic, when some patient treatments were restricted or deferred because of limited ward and intensive care bed capacities. RANZCR published a position statement supporting the continued delivery of safe and effective, minimally invasive Interventional Neuroradiology services in hospitals and health care organisations[75].

To illustrate how these beneficial health outcomes have translated into helping the lives of real patients, please see Appendix C for a selection of local patient experience stories featuring the role of Interventional Neuroradiology.

The Evolution of Interventional Neuroradiology

RANZCR has long recognised Interventional Neuroradiology as a progressive and innovative specialty that contributes to high-value patient care. Interventional Neuroradiology has an active role in the longitudinal care of patients and has affirmed its important place in modern medicine by establishing high-quality, evidence-based standards of care and providing critical health services to patients in hospitals and in the community. In addition to primary patient care, Interventional Neuroradiology also plays an essential role supporting other medical and surgical services within the hospital system.

The practice of Interventional Neuroradiology started as a procedure-based field 40 years ago with initial recognition and funding by the Federal Government (see Appendix B), and since then has continued to evolve into a clinical specialty and an essential part of modern health care.

Advances in technology and novel techniques have driven the expansion of Interventional Neuroradiology. The rapid transformation of neuroimaging and revolutionary minimally invasive technology[76,77,78,79,80 81,82,83,84,85,86,87,88,89] have resulted in improved treatment options for a broad range of neurological conditions previously untreatable or only treatable by open surgery, such as ruptured and unruptured cerebral aneurysms[90,91,92,93,94,95,96,97] vascular malformations in the head and spine,[98,99,100] neuro-oncology [101,102] and endovascular treatment of large vessel occlusion stroke across the country.[103],[104,105,106,107,108] The latter is now recognised as the standard of care in Australia and internationally. With a comprehensive and developing body of local and international research, literature, practice and innovation, increasing numbers of conditions are being successfully managed by Interventional Neuroradiology with outcomes that

require shorter hospital stays and resultant cost efficiencies, ultimately benefiting patients and the entire Australian health care system.[109,110,111,112,113,114,115,116]

As neurological conditions in the population continue to increase, with the prevalence of major disabling neurological disorders steeply increasing with age,[117] the continual pursuit of treatments that produce improved health outcomes and reduce burden of disease in the population will be imperative. This will see the role of the Interventional Neuroradiologist expand further, and the growing demand for Interventional Neuroradiology services will require an increased need for trained specialists.

The Road Towards Specialty Recognition

RANZCR established the Faculty of Clinical Radiology about a decade ago, in recognition of the increasingly clinical role of the radiologist. With the expanding footprint of clinical radiology, the RANZCR Board and the Faculty of Clinical Radiology Council established a standing committee to oversee and develop the spectrum of Interventional Neuroradiology[118] just over five years ago. The Interventional Radiology Committee (IRC) is responsible for advising the Faculty of Clinical Radiology Council on the educational, professional and practice aspects of Interventional Neuroradiology – to ensure that clinical radiologists are supported to deliver accessible, evidence-based, best practice interventional care to patients[119].

This led to the release of a RANZCR position statement in early 2020, outlining the current and long-term contextual environment for Interventional Neuroradiology, as well as a road map towards achieving specialty recognition in Australia and New Zealand[120].

Interventional Neuroradiology Training

All Radiologists in Australia are specialist medical practitioners who have undertaken medical training and completed RANZCR's 5-year Australian Medical Council accredited clinical radiology specialist training program[121]. Under this program, all prospective radiologists are trained to perform basic interventional procedures (i.e., biopsies, drainages and vascular access). However, Interventional Neuroradiology practice requires advanced clinical knowledge, behaviours and skills to manage a wide range of conditions and to perform more complex image-guided diagnostic and therapeutic procedures, beyond those acquired during core diagnostic radiology training.

Clinical competence of a clinician is an important aspect of consumer confidence in health care. The ever-increasing range of conditions and complexity of procedures has necessitated Interventional Neuroradiologists practicing in established Interventional Neuroradiology centres to undertake extensive post graduate training. After completing RANZCR training program, Fellows undertake specialist fellowship training, which typically consists of a 12-month Diagnostic Neuroradiology Fellowship (or equivalent documented experience within the 5-year training program) plus a minimum of 24 months of Interventional Neuroradiology Fellowship/s at 'high volume' Australian and/or overseas centres. These fellowships currently vary in breadth and rigour, are unregulated and are not mandatory to practice Interventional Neuroradiology in Australia.

The Conjoint Committee for Recognition of Training in Interventional Neuroradiology (CCINR committee)[i], was established in 2014 to set minimum benchmarks for the safe performance of endovascular Interventional Neuroradiology procedures by practitioners in Australia and New Zealand.[122] Despite its importance to Interventional Neuroradiology practice, CCINR is a registry and not a formal regulatory body; the CCINR does not mandate training or hospital accreditation and inclusion on its register is not compulsory to be able to practice Interventional Neuroradiology in Australia. Whilst RANZCR has formally endorsed the CCINR recognition of

[i] The CCINR is a joint committee comprising representation by the Australian and New Zealand Society of Neuroradiology (ANZSNR), the Neurosurgical Society of Australasia (NSA) and the Australian and New Zealand Association of Neurologists (ANZAN).

training guidelines, clinicians who meet these guidelines are not recognised with Interventional Neuroradiology specialist status, nor is it a requirement to practice.

Driven by a commitment to the safe delivery of health care, the College is developing a dedicated, contemporary and accredited Interventional Neuroradiology training pathway. This will include the full range of Interventional Neuroradiology practice and procedures to be delivered by appropriately trained and highly skilled Interventional Neuroradiology clinicians,[123] ensuring currency of practice and competency that keeps pace with the rapidly evolving technology for image guided minimally invasive procedures, maximising benefit to patients while minimising risk.

Practice Standards

The *RANZCR Standards of Practice for Clinical Radiology*[124] define the standards by which Diagnostic and Interventional Neuroradiology services in Australia are expected to be delivered. The Interventional Radiology Standards Working Group of the IRC[125], in consultation with key stakeholders[126], is currently developing the first stand-alone version of Standards of Practice for Interventional Radiology and Interventional Neuroradiology in Australia. These standards define the minimum acceptable practice standards for facilities and staff providing Interventional Neuroradiology services, to protect patient and practitioner safety and enable best quality care.

Stakeholder Engagement and Relationship Management

RANZCR, through the IRC, is engaging with its members and other key stakeholders – to facilitate networking and collegiality with other colleges and professional societies. One of RANZCR's main focus areas has been consultation and ongoing discussions with the Australian and New Zealand Society of Neuroradiology, to facilitate collaboration towards a shared vision and common goals for INR – which includes specialty recognition for Interventional Neuroradiology in Australia.

Indicative Timeline

In Australia, the process for applying for a field of specialty practice is a multi-staged linked process. RANZCR intends to submit an initial application to the Medical Board of Australia in 2022. The assessment of this application to determine whether RANZCR has a case for recognition will take approximately 6 months and the outcome will determine the College's path for all related future activities.

The College intends on pursuing a similar path in New Zealand with the Medical Council of New Zealand in 2022/23.

APPENDIX A

Australian Health Practitioner Regulation Agency list of medical specialties

The table below outlines RANZCR's existing medical specialties: Radiation Oncology and Radiology and the proposed new field of specialty practice: Interventional Neuroradiology.

SPECIALTY	FIELDS OF SPECIALTY PRACTICE	SPECIALIST TITLE
Radiation Oncology	-	Specialist radiation oncologist
Radiology	Diagnostic radiology	Specialist radiologist
	Diagnostic ultrasound	Specialist radiologist
	Nuclear medicine	Specialist in nuclear medicine
	Interventional Neuroradiology	Specialist Interventional Neuroradiologist
	Interventional Radiology*	Specialist Interventional Radiologist*

* Please refer to the Interventional Radiology briefing pack for this proposal

APPENDIX B

Additional Clinical Information

Evolution of Interventional Neuroradiology

The first Interventional Neuroradiology procedure was performed in Australia in 1979. With increasing interest in the range of techniques being developed, the Federal Government acknowledged the many benefits achieved by specialist Interventional Neuroradiology. The early 1990's saw centralised pilot funding for the evaluation of endovascular techniques being applied to brain arteriovenous malformation, dural arteriovenous fistulas and cerebral aneurysms at two national centres (one in Western Australia at Royal Perth Hospital and one in New South Wales split between Royal North Shore Hospital and Royal Prince Alfred Hospital). Due to the overwhelmingly favourable beneficial patient outcomes, reduced length of hospital stays[127,128,129] and demonstrated cost efficiencies, further funding for additional Interventional Neuroradiology centres were rolled out across the country in the 2000s, ensuring equitable and increased patient access.

A further benefit of the foresight of the funding from the Australian Government resulted in a highly skilled and trained local Interventional Neuroradiology workforce which is and has been respected globally for over 20 years.

Interventional Neuroradiology treatment options for patients with cerebral aneurysms has markedly expanded since the mid 2000's. The International Subarachnoid Aneurysm Trial (ISAT)[130] was stopped prematurely as the outcomes for endovascular cerebral aneurysm repair versus open surgery were so pronounced (22.6% relative risk reduction for dependency and 6.9% relative risk reduction for death) that it was felt unethical to continue the trial.

In the last 20 years, the maturing of Interventional Neuroradiology practitioners together with the expansion of endovascular techniques such as the addition of new coil technology,[131] balloon assist,[132,133] stent assisted coiling,[134,135] flow diversion[136,137,138,139,140,141] and endo saccular devices,[142] have revolutionised the treatment of ruptured and unruptured cerebral aneurysms in Australia and internationally.[143,144,145,146,147,148,149,150]

Interventional Neuroradiology treatment of large vessel occlusion acute ischaemic stroke with mechanical thrombectomy is now recognised as standard of care in Australia and internationally. Endovascular treatment of large vessel occlusion acute ischaemic stroke in Australia has been performed since 2009[151,152] but the advent of stentriever[153] / large bore flexible catheter technology[154] and the publication of 5 landmark trials in 2015[155,156,157,158,159] acted as a catalyst for rolling out endovascular treatment of large vessel occlusion stroke across the country.[160,161,162,163,164,165]

Examples of patient benefits that Interventional Neuroradiology brings, include but are not limited to the following:

- Cerebral Aneurysms and Subarachnoid Haemorrhage
    - Almost 500,000 Australians have a cerebral aneurysm. Cerebral aneurysm rupture and subarachnoid haemorrhage is potentially fatal, and those who survive may suffer permanent brain damage.
    - Unruptured aneurysms treated by endovascular techniques rather than open surgery, on the whole, have less complications, much lower risk of postoperative infection, shorter inpatient stay, less likely to need rehabilitation and return to work more quickly with generally less restriction on returning to driving as no craniotomy is required.[166,167,168,169,170,171,172]
    - Death rates from subarachnoid haemorrhage have progressively fallen over the last 15 years[173,174] due to endovascular techniques[175,176,177,178,179] (including balloon angioplasty treatment of vasospasm,[180,181,182] and the advent of comprehensive medical supportive therapy.[183]

    - There are over 2500 endovascular cerebral aneurysm repairs performed every year in Australia.

- Acute Ischaemic Stroke
    - Large vessel occlusion stroke is responsible for the most disabling of strokes and a significant cause of personal and community financial burden.[184]
    - Treatment of large vessel occlusion acute ischaemic stroke by mechanical thrombectomy has been shown to be one of the most potent treatments in modern medicine (Number Needed To Treat of 3 to reduce disability)[185,186] and is established as the standard of care in Australia.[187,188]
    - Mechanical thrombectomy is simultaneously a highly cost-effective treatment.[189,190,191,192, 193,194]
    - There are over 2600 mechanical thrombectomies performed every year in Australia.

- Other cerebrovascular diseases such as carotid or vertebral artery stenosis (narrowing) and intracranial artery stenosis can be treated efficaciously at the time of acute ischaemic stroke mechanical thrombectomy and in other patients at risk of disabling stroke.[195,196,197,198]
- Endovascular and percutaneous treatment of dural arteriovenous fistula and carotid cavernous fistula[199,200,201] is now established as the first line treatment option.
- Interventional Neuroradiology plays an important role in the diagnosis, workup and planning of treatment options in brain and spine arteriovenous malformation (AVM). Preoperative embolization of AVM is a recognised important adjuvant therapy.[202]
- In the setting of vascular trauma,[203,204,205] uncontrolled epistaxis,[206,207] or bleeding from head and neck tumours.[208] Interventional Neuroradiology provides an option where open surgery to stop bleeding may not be feasible.
- Interventional Neuroradiology is a recognised and successful low morbidity treatment of intracranial hypertension.[209,210,211]
- Percutaneous stabilisation of vertebral insufficiency fractures (vertebroplasty)[212,213,214,215] has shown back pain relief and mortality benefit.
- Interventional Neuroradiology provides percutaneous treatment of head and neck vascular malformations[216,217] with sclerotherapy sometimes the only treatment option for lesions with extensive involvement of adjacent organ systems.
- Interventional Neuroradiology techniques can complement surgery in chronic subdural haematoma, decreasing return to theatre for recurrent bleeding and decreasing length of stay. [218,219]

APPENDIX C

Interventional Neuroradiology Patient Stories

Below is a sample of Australian patient experience stories showcasing Interventional Neuroradiology (INR).

- Selwyn was successfully treated for his ruptured internal carotid artery aneurysm. Read Selwyn's story as featured in the RANZCR newsletter (September .
- Nicole was successfully treated for her ruptured basilar tip aneurysm (see first story below)
- Nigel was successfully treated for large vessel occlusion acute ischaemic stroke (see second story below).

Nicole's story
"I couldn't have imagined that today I'm able to learn a new language while living in Finland if I didn't have an Interventional Neuroradiologist who treated my condition in 2016! I can't imagine what my life might look like!"

Nicole could not hold back her gratitude when talking about what she went through in February 2016. She was at work when she started to feel very sick and had to have her dad pick her up to take her home. The next thing she remembered was that her mother was standing by her bedside with a cup of tea looking worried. Nicole had been unconscious for the past few days.

Following that initial incident, she suffered from constant headaches, always felt tired and was in bed most days. She decided to see a doctor who then referred her for an MRI scan. To her horror and disbelief, the MRI identified a bleeding aneurysm in her brain. She was immediately wheel-chaired to the emergency department for urgent attention.

She was faced with two options at this critical moment: having her head cut open to remove the blood clot and clip the aneurysm; or having an Interventional Neuroradiology treatment to repair the aneurysm through a tiny incision in the groin. Nicole chose the latter because of its minimal invasiveness. Nicole's Interventional Neuroradiologist performed the treatment by inserting catheters, which are fine tubes, into the blood stream at the groin and guided them through to the brain, where a series of small platinum coils were accurately placed inside Nicole's ruptured basilar tip aneurysm to stop the bleeding.

It worked! The procedure, called a balloon assisted coil embolisation, succeeded in providing the best possible long-term outcome for Nicole. Nicole has been given a new lease on life. She was able to return to work, get married and now enjoys learning Finnish as a second language.

Did you know?
A brain aneurysm or cerebral aneurysm is a bulge or a sac that develops in a blood vessel in the brain due to a weakness in the blood vessel wall.

- 3% of people have a cerebral aneurysm and almost 500,000 Australians have an aneurysm.
- Most brain aneurysms don't rupture; however, it is potentially fatal if it ruptures, and those who survive may suffer permanent brain damage.

Treating an unruptured brain aneurysm may be appropriate in some cases. If concerned patients should speak to their GPs to arrange a referral to see an Interventional Neuroradiologist.

Interventional Neuroradiology treatments of cerebral aneurysms include coil embolisation, balloon assisted coil embolisation, stent assisted coil embolisation, flow diverting stents, intrasaccular devices, and more.

Nigel's Story
"I was super lucky – the procedure done by my Interventional Neuroradiologist was life changing! Modern medical technology is incredible!"

Nigel, a civil engineer in his 50s, 6'3 feet tall and fit, has been living an active and healthy life. He never expected that he would collapse on the street one day.

It was November 6, 2016 and as Nigel was finishing his lunch, he noticed that he couldn't hold the meal tray horizontally. Without thinking too much about it, he walked out of the restaurant and back to work. He suddenly lost control of the left side of his body and fell to the ground. He was immediately rushed to the nearest hospital. A CT scan showed a blockage of the blood supply to the left side of his brain. Nigel was having a very serious stroke.

The next thing he knew was that he was in a hospital bed and surrounded by his wife and children. The blood clot in Nigel's left internal carotid artery and left middle cerebral artery clot had been removed by an Interventional Neuroradiologist under image guidance through a tiny incision in his right groin. From start to finish, this endovascular clot retrieval by the interventional neuroradiology team took 40 minutes.

Nigel's recovery went well, and he was able to return home after 2-3 weeks in hospital. He cannot thank the interventional neuroradiology team enough. His Interventional Neuroradiologist was able to take quick action, to operate within the critical timeframe to perform the procedure that saved his life. He said: "I was super lucky because the procedure done by my Interventional Neuroradiologist was life changing! Modern medical technology is incredible!"

It was a life changing event causing Nigel to re-evaluate what was really important in his life. Now he's happily retired, enjoying afternoon tea in the warm sunshine with his wife when re-telling his story.

Did you know?
- Every 10 mins someone in Australia will suffer a stroke.
- There are more than 51,000 strokes annually, 85% of them are ischaemic stroke.
- 90-day ischaemic stroke mortality is 20%
- Two thirds of stroke survivors are disabled
- Reperfusing the brain is extremely time critical
- Every 4-minute delay results in one more patient out of 100 being more disabled
- For every minute saved, the average patient gains a week of disability-free life
- Interventional Neuroradiology and endovascular clot retrieval has been shown to be one of the most potent treatments in modern medicine and is established as the standard of care for large vessel occlusion acute ischaemic stroke.

- **Western Australia Leading the Way in Offering New 24/7 Life Saving Stroke Treatment** (https://www.youtube.com/watch?v=mf6uDkORBRY) *(Ch 9 News Perth, 19 Sep 2016).*
    - This news story outlines the case of Mr Jamie Schusteo who experienced a severe stroke and was rushed to the Sir Charles Gairdner Hospital (SCGH) in Perth, Western Australia (WA). The medical team was on standby and in 14 minutes Jamie underwent surgery to remove the blood clot from his brain.
    - The Interventional Neuroradiologist at Sir Charles Gairdner Hospital says that for patients under 60 years old who have a stroke, for those able to access this treatment within 4.5 hours, 60% will walk out of hospital and return to daily normal living.
    - This life-saving stroke treatment is available in WA 24 hours a day, 7 days a week, but unfortunately WA is one of the only places in the world to be able to offer this treatment.

- **New Life-Saving Treatment Available for Australian Stroke Victims** (https://www.youtube.com/watch?v=9kM5KYoR5Ho) *(Ch 9 News, 27 Feb 2014).*
    - This news story describes how new minimally invasive treatments have revolutionised treatment of life-threatening strokes.
    - Mr George Pallalis, 67 years old, went to hospital as he suffered a stroke and was feeling numb down one side. The Interventional Neuroradiologist at the Royal Melbourne Hospital saved George's life by carrying out the Interventional Clot Removal Procedure. Using an angiogram, a needle is placed into the artery in the groin with a small catheter threaded through the blood vessel directly into the clot. A mesh device expands and picks up the clot, which is then withdrawn and removed from the body.
    - With 1 in 6 people suffering a stroke in their lifetime, this procedure will decrease the risk of death or lifelong disease.
    - The key to success is having timely, readily available access for patients to INR treatments in all Australian hospitals without delay.

- **Revolutionary Stroke Treatment Available for Young Rural Patients** https://www.youtube.com/watch?v=GFG-J5CtHPs *(Today Tonight 10 July 2017)*
    - Sam, a 16-year-old teenager, was having a stroke, after an accident with his BMX bike.
    - Sam had a headache and didn't think much of it but 5 days later was on his way to Perth with the Royal Flying Doctor Service, for emergency life-saving stroke treatment. It took 90 minutes from the time the phone call was received to the time Sam was transferred from a rural hospital to a Perth hospital.
    - The Interventional Neuroradiologist used a technique called Endovascular Clot Retrieval to remove the blood clot which was blocking Sam's artery.
    - Untreated stroke can result in permanent brain damage or death and rural patients have a geographical disadvantage because of the time critical nature of stroke.
    - Within 2 days, Sam was up and walking, with no limp or speech problems. Sam is the youngest patient to be treated with Endovascular Clot Retrieval in Western Australia.

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