THE RHYTHM STRIP

The newsletter for Professionals in Cardiac Sciences Australia

Now welcoming readers from The Society of Cardiopulmonary Technology New Zealand

Autumn 2024

PiCSA

www.picsa.org.au

Our Mission

To promote a commitment to excellence in standards of clinical best practice, provide the resources for ongoing continuing education of our members as well as promote and raise the profile of cardiac sciences both within & outside the profession.

Our Vision

To perform well as the peak professional resource and representative body for all Cardiac Physiologists in Australia through collaboration and cooperation with its members and other peak professional organisations.

Our Values

Adherence to the highest standards of professional and ethical behaviour.

Provision of safe, evidence based best practice to patents under our care.

Be accountable for our actions as health care practitioners.

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From the Chair

Miriam Norman (TAS)

A few years ago, a private cardiology clinic approached me with a request to train one of their medical receptionists to become their new pacemaker "technician". While I appreciated their recognition of the need for specialised training, this request felt akin to asking a high school graduate to train and practice in a specialised field of law, ignoring the pool of law graduates eager for the role. Recent events have made me reflect once again on that experience. Here are some of my Autumn Quarter thoughts:

Addressing Government Responses

The government aims to reduce reliance on industry for workforce labour, ensuring compliance with the established international standard of care in both public and private sectors. The practical implementation of this goal is a pressing concern, because the loss of one workforce opens up real vulnerabilities. Cardiologists will need to consider employing and compensating their own staff appropriately. The notion that a receptionist or "one of our nurses" can do that (despite a shortage of nurses) should not be the only perceived solutions. We have immediate concerns about patient safety, as there is nothing preventing a cardiologist from using an unqualified individual to fill in for the (possibly highly qualified) company representative who can no longer attend, paying them cheaply instead of ensuring proper compensation for skilled professionals. There is a better solution, but it involves a collective commitment to quality care.

Regulation and Progression of Cardiac Physiology

Alarmingly, among the five Cardiac Physiology modalities, only Echocardiography has safeguards in place to prevent unqualified, unregistered, and potentially incompetent staff from practicing (albeit far inferior to AHPRA's safeguards). Although a "supervising" cardiologist is legally responsible for procedures performed by Cardiac Physiologists, this oversight alone is insufficient to ensure patient safety.

As technology becomes increasingly complex, it is imperative to advance and regulate the Cardiac Physiology workforce. The technical expertise required in certain focused areas of cardiology now often surpasses the knowledge base of many cardiologists. Therefore, it is crucial to adopt a multidisciplinary approach, empowering Cardiac Physiologists to advance their practice and more comprehensively support their teams. There is huge potential for progression of all five cardiac physiology modalities.

We must do more than just hope for a better future

It is imperative that the voice of Cardiac Physiologists is included in workforce planning at a government level and that we lead conversations about competency, scope of practice, and regulation. As the private sector moves away from reliance on industry and towards a more appropriate labour model, we especially need to fully engage in supporting the existing and future cardiac device workforce, including industry-employed Cardiac Physiologists who will continue to play an essential internationally accepted role.

Advocacy and Actions Over the Autumn Quarter

Advocacy and Leadership

Over the autumn quarter, PiCSA has been actively advocating for the profession and providing strategic leadership to advance our field. We have shared our Entry and Career Pathway document extensively as a practical guide for employers and workers regarding training, remuneration, and regulation. This document serves as a resource to guide appropriate employment decisions, such as hiring science graduates rather than receptionists for cardiac physiology roles.
We have also proactively supported current research efforts that will directly impact protocols and service funding. Collaboration with our sister professional associations in respiratory, neuro, and sleep physiology has been a focus, fostering shared interests, values, and goals, and promoting our shared registry of accreditation, the ACCP (the ACCP fills the gap for Cardiac Physiologists not covered by ASAR).

Engagement and Visibility

We continue to maintain visibility with multiple organisations, including ASA, ASAR, CSANZ, MTAA, Hearts 4 Heart, our New Zealand counterparts, and unions, regularly inviting feedback and collaboration. Educational content has been a priority, with webinars and newsletter articles, including a fantastic social event for Australia's National Cardiac Physiologists Day (May 21st), celebrating our profession and building a sense of professional identity and community.

Strategic Development

Our strategic plan and constitution are being redrafted, and we are supporting a new educational pathway for Cardiac Device Physiologists (details yet to be announced). We have initiated work on scope of practice and competency assessment documents and continue to flag current challenges such as disparities in pay, variation in scope of practice, difficulty accessing education or competency assessment tools, and lack of employer support for paid continuing professional development.
Through these efforts, PiCSA remains dedicated to promoting the highest standards of practice in Cardiac Physiology, advocating for the profession, and ensuring patient safety in an evolving healthcare landscape.

To our PiCSA members, thank you for your membership. As a volunteer organisation, we rely on our membership numbers to validate our authority as the voice of the profession, and to fund our activities. Your input as a voting member is crucial in guiding and directing our activities. If you are an Australian Cardiac Physiologist who isn't yet a PiCSA member, please consider joining us by signing up at https://picsa.org.au/join Employers can also contact PiCSA to negotiate a discounted membership rate (group discount) for eligible staff working in ECG (non-invasive), Cath Lab, Echo, Cardiac Devices, and Electrophysiology.

To our other readers, thank you for engaging with this "From the Chair" newsletter extract. PiCSA's mission is to promote a commitment to excellence in standards of clinical best practice, provide resources for ongoing continuing education of our members, and raise the profile of cardiac sciences both within and outside the profession. We hope you will continue to follow our journey and engage with us in supporting cardiac care throughout Australia.

Warm Regards,

Miriam

Membership Report + Announcements

Tina Hetherington (QLD)

Professional Members 211
Associate 29
Affiliate 6
Student 45
Life 2

PiCSA Membership

As we quickly approach the halfway point of 2024 I feel it is a good time to reflect on the first few months of the year.

Our PiCSA Membership numbers continue to remain steady at just under 300 members. The PiCSA Board are working on strategies to strengthen our membership numbers and therefore professional identity through improving the visibility and awareness of PiCSA. If you require any assistance with your PiCSA membership, please email membership@picsa.org.au

We have held four education meetings so far this year, all of which have had strong attendance with many familiar names, but we are seeing some new faces online which is fantastic. Topics have covered the modalities of ECG, Cath Lab, EP and Echo. Once again, we would like to thank the presenters for their time and expertise in providing this education to our PiCSA members.

All these education meetings can be found in the "Education Portal" in the members-only section of the PiCSA website, along with over 30+ hours of other education content.

Upcoming Education Meeting

PiCSA's next education meeting is scheduled for Monday 24th June. In this meeting will focus on the topic of professional issues. Check our website and social media pages for full details of this meeting. Register at www.picsa.org.au/events

Many Great Benefits of PiCSA membership

- Access to Members Only articles, videos, education presentations and resources
- Exclusive discounts to industry affiliate partner events and courses
- Free advertising of employment opportunities on the PiCSA website
- Invitation to all in-person and online PiCSA educational meetings
- CPD point certificates for attendance at education meetings
- Quarterly newsletter update from the Board, and more!

Join the ACCP to Elevate Your Career & Legitimise Your Profession

Accreditation and registration are essential for all Cardiac Physiologists, not just those specialising in Echo. If you work in Echo, your accreditation registry is the ASAR. However, if your expertise lies in ECG (non-invasive), Cath Lab, Cardiac Devices, and/or Electrophysiology, the Australian Council for Clinical Physiologists (ACCP) offers you similar recognition.

The ACCP is a mark of professionalism and helps establish national standards. By registering with the ACCP, you enhance your professional status and gain recognition from employers, patients, and professional bodies. Additionally, you can add the post-nominal "ACP – Cardiac" to your credentials.

Join NOW for the best value, as the ACCP membership year aligns with the financial year. Visit the Australian Council for Clinical Physiologists website at https://theaccp.org.au/ to learn more. Supporting ACCP registration helps to improve patient safety and advance our profession as a whole. Together, let's elevate Cardiac Physiology to new heights.

Cardiac Physiologist Day – 21st of May 2024

Dear Australian Cardiac Physiologists,

Happy Cardiac Physiologists Day!

Today is the day to celebrate our brilliant profession, raising awareness of our unique identity and many excellent contributions to healthcare. As a cardiac physiologist, you hold a pivotal role in your clinic or hospital, performing scientific evaluations and providing key technical support for many cardiac interventions.

This day, 21 May, marks the birthday of Willem Einthoven, the doctor and physiologist who pioneered the clinical electrocardiogram in the late 1800s. The ECG is foundational to all five modalities of specialisation within our profession. Whether you work in ECG (non-invasive), the Cath Lab, Echo, Cardiac Devices, or Electrophysiology, we proudly celebrate together on Einthoven's birthday, much like all nurses honour their profession on Florence Nightingale's birthday.

As we celebrate National Cardiac Physiologists Day, let us also look to the future with optimism and resolve. The field of cardiac physiology and the Australian labour model for our profession are ever-evolving. We face significant challenges as the government implements changes to the role and funding of industry-employed cardiac physiologists. Recruitment and retention are threatened by large inequities in remuneration, artificially limited scopes of practice, and underdeveloped career progression pathways. Some employers still do not adequately recognise or financially support essential training and certification activities. Many of us are not even acknowledged as legitimate health professionals, and we are collectively hindered by a lack of both visibility and audibility in policy and governance processes.

As the voice of cardiac physiologists, Professionals in Cardiac Sciences Australia (PiCSA), alongside the Australasian Sonographers Association for Echo Physiologists, is working hard to unify, support, and advocate for all cardiac physiologists. We are fostering collaboration with other allied health organisations and actively building relationships with industry and the broader cardiac community, including CSANZ. This year, we published an important position statement containing recommendations relevant to government agencies, employers, unions, and cardiac physiologists at all stages of their careers to help shape the profession and build a brighter, healthier future for all.

We must not be passive. Your participation in PiCSA membership and regulatory activities, such as the ACCP, is essential to fortify our profession ahead of new challenges and opportunities.

On behalf of Professionals in Cardiac Sciences Australia, I extend my heartfelt thanks for your contributions and commitment. Let us celebrate our successes, honour our shared purpose, and look forward to the continued progress we will make together, one heartbeat at a time.

With warm regards,

Miriam Norman and the PiCSA Board
Professionals in Cardiac Sciences Australia

Cardiac Physiologist Day – continued

Diagnose This...

Creation from the Queensland Children's Hospital
Brisbane, QLD

Princess Alexandra Hospital
Brisbane, QLD

Heart Centre at Alfred Hospital
Melbourne, VIC

PiCSA's 6th ANNUAL NATIONAL CARDIAC PHYSIOLOGISTS' DAY

TRIVIA NIGHT

The 6th National Cardiac Physiologists' Day Trivia Night was held on 21st May 2024. This annual event is held to celebrate all the Cardiac Physiologists across Australia in what is always an exhilarating evening of knowledge and camaraderie.

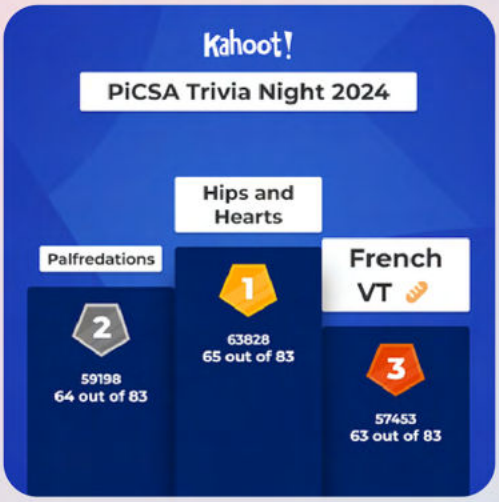
Our hosts for 2024 were PiCSA Board Members Leah Wollin and Jenny Fong, who both ensured the evening was very entertaining with a bit of learning along the way. We are thankful to the Victorian Heart Hospital for allowing PiCSA to host from this venue again in 2024.

Once again, we had an incredible amount of interest in the Trivia Night with 13 teams registered! There was a mix of familiar faces as well as some new competitors this year. Unfortunately, the 2023 champions "Playing Heart to Get" from Canberra Health Services were not able to enter a team this year to defend their title.

The "Loose Cannons" from Toowoomba Hospital dominated early in the trivia. This team was certainly one to watch having placed a very close second in the 2023 trivia event, even though they had answered the most questions correctly. "Hips and Hearts" from the Queensland Children's Hospital and "French VT" from the Victorian Heart Hospital also maintained consistent placings at the top of the leader board in the first half of the night. There was fair amount of place jumping in the the first half of the evening but by the brief half time intermission the team from Alfred Health had made their way into second spot just behind Hips and Hearts!!

Unfortunately, a technical issue saw the Toowoomba team drop out of the top 5 early in the second half of play. The intermission refuel certainly benefited a few teams and we saw the "Tassie Tickers" and "Royal Adelaide Hospital Monkeys" making their first appearances in the top 5 leader board.

The scores were very close in the final stages of the trivia night and the win could have gone to any of the teams in the top 5 at this stage. Double points came into play for the final 4 questions and with half of the teams answering 2 of these questions incorrectly it lead to a convincing win from the team at **Queensland Children's Hospital: Hips and Hearts!!!**



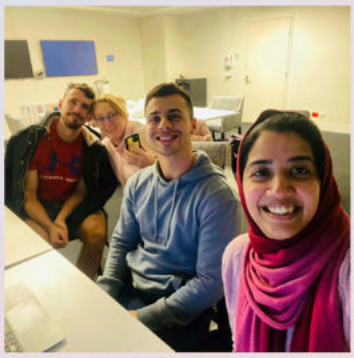
Trivia Night 2024

Hips and Hearts
Queensland Children's Hospital
Brisbane, QLD

Palfredations
Alfred Health
Melbourne, VIC

French VT
Monash Heart
Melbourne, VIC

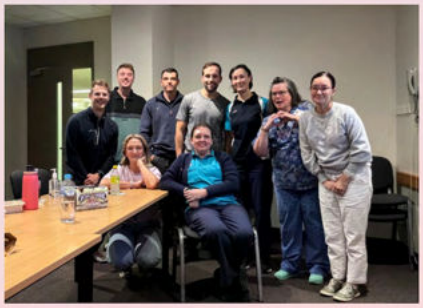
Trivia Night 2024



West Hawthorn Heart Stoppers
Epworth
Melbourne, VIC

Naughty Northy Nodes
Royal North Shore Hospital
Sydney, NSW

Perthcardium
Advara HeartCare
Perth, WA



Newy Hunters
Newcastle Hospital
Newcastle, NSW

The Brady Bunch
Global Cardiology
Perth, WA

Loose Cannons
Toowoomba Hospital
Toowoomba, QLD

RAH Monkeys
Royal Adelaide Hospital
Adelaide, SA

Ventricular Villians
Perth Cardiovascular Institute
Perth, WA

Tassie Tickers
Royal Hobart Hospital
Hobart, TAS

Pulse Patrol
Advara HeartCare
Adelaide, SA

PiCSA Member Spotlight

Alison needs no introduction, as she is renowned nationally and serves as a mentor to many. PiCSA and its board are honoured to feature her as our inaugural member spotlight. We are delighted to pass the microphone to Alison as she introduces herself, shares her journey in cardiac physiology, and imparts her valuable messages to the PiCSA community. Thank you, Alison, for being such an inspiring role model in our profession.

What made you decide to become a physiologist, specifically within the field of cardiology?

I studied a Bachelor of Science majoring in Pharmacology and Physiology (UQ), and it wasn't until the final year of my degree that I even knew about Clinical Physiology. I saw the Graduate Diploma of Clinical Physiology (back then it was a Masters) advertised at Griffith and applied. I really enjoyed the coursework for the cardiac content and when it came time to choosing a placement, my first choice was cardiology, because it combined my passion for science with my motivation to undertake a career in which I can be helpful to people.

What do you specialise in?

I am an accredited medical sonographer (cardiac), completing my DMU (Cardiac) in 2000. I chose to specialise in echocardiography because I was fascinated in the way that this technology can visualise and assess cardiac structure and function in a non-invasive and time efficient manner.

What are you passionate about?

I am currently working as a Senior Lecturer at Griffith University. I am passionate about connecting students with the clinical workplace; supporting them to find which area of physiology that motivates them and supporting their problem-solving skills and emotional regulation through reflective practice, which are crucial aspects of professional growth. I am also passionate about supporting the continuing professional development of clinical physiologists, including supporting clinical supervisors to develop their skills and techniques in constructing and delivering feedback as well as encouraging and supporting positive culture changes in clinical physiology workplaces.

What do you do for fun/hobbies?

Outside of work, I enjoy walking in nature, playing tennis with my family, cooking up a storm and trying out new places to explore. These activities help me to find balance and recharge me amidst my busy professional life.

Are there any completed or upcoming research projects or presentations we should keep an eye out for?

At the start of 2024, my colleagues Linda Humphreys, Donna Oomens and I published in 'Sonography' important articles on communicating with older adults and the concept of reflective practice for promoting resilience. I strongly believe these papers can help bring change to clinical practice, to improve the well-being of clinical physiologists and also improve the quality of patient care. Later this year, I hope to publish my current research which is focussed on the use of reflective journals for students undertaking clinical placements, exploring the benefits for problem-solving skills and emotional regulation.

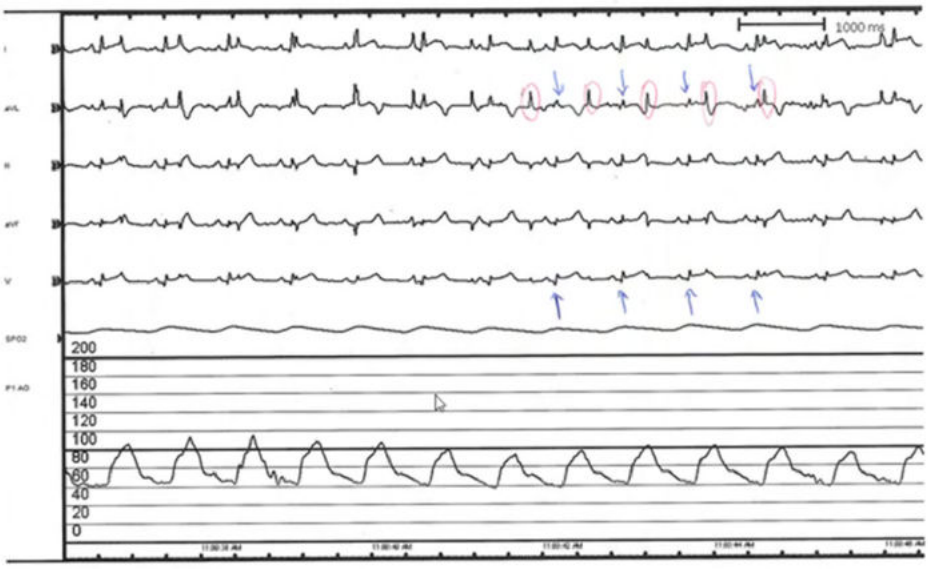
My mantra is "your journey as a clinical physiologist is not only about scientific knowledge but also about compassion, empathy, and making a difference in patients' lives."

An Interesting Cause of Significant Artifact in the CCL

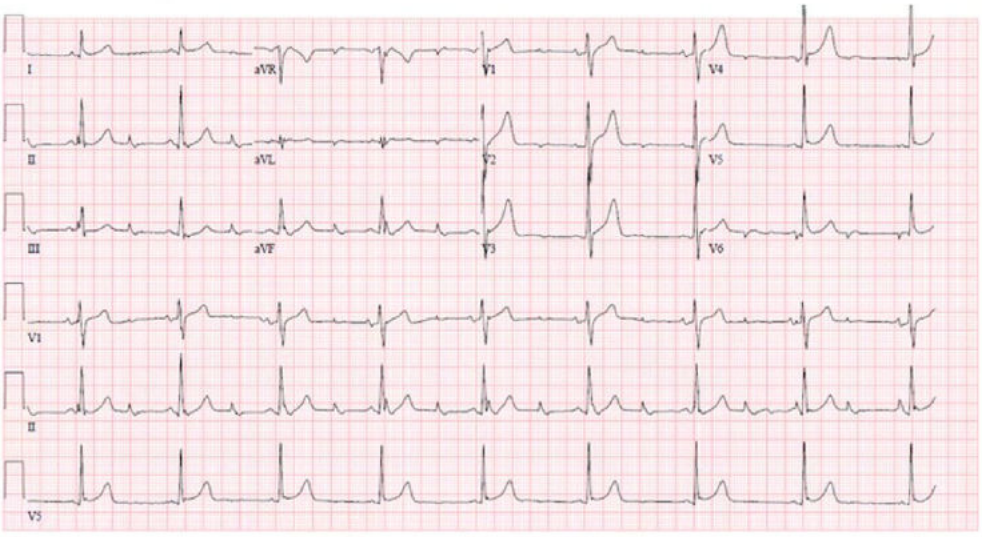
By Breony Heanue, Princess Alexandra Hospital, QLD

A little while back, the Cardiac Catheterisation Laboratory (CCL) at Princess Alexandra introduced a new brand and model of intravenous (IV) infusion pump (BD Alaris) and the cardiac physiologists started noticing that on occasion, the haemodynamic monitoring system's ECG would display an impressive artifact, particularly when the IV pump was running at the maximum flow rate (999ml/hr).

The artifact was so impressive that sometimes the signals were indeed larger than the QRS complexes. Below is an example of this - the blue arrows indicate the QRS and the red circles indicate the artifact in question.



There is a substantial amount of literature available on ECG artifacts caused by IV pumps in hospital environments(1), even a great case study of a post-operative patient where the ECG had IV pump artifact that looked like P waves, which could've been misdiagnosed as high grade AV block by the undiscerning eye (2):



Cause of artifact:

This type of artifact appears to be caused by static and/or piezoelectric charge which is generated by the mechanical rubbings of the plastic polymer tubing of the IV infusion set. Some articles state that this piezoelectric charge current then flows into the patient vasculature via the saline fluid in the tubing, and is subsequently detected on ECG electrodes; artifact will cease simply by detaching the still-running infusion line from the patient's cannula (3).

Literature suggests that the likelihood of this artifact increases with:

- improper grounding of equipment
- loose ECG electrodes
- broken ECG leads

Our course of action:

Our team attempted everything to minimise this artifact – replacing leads and electrodes, repositioning the location of the ECG equipment and the IV pump, adjusting filters and settings on the haemodynamic monitoring system. The problem recurred across multiple IV pumps and monitoring systems and labs; it could not be isolated to a particular faulty piece of equipment.

In the end, the best tool we had to mitigate the risk of ECG misinterpretation was the discerning eye of a qualified Cardiac Physiologist!

The first step is always to ensure they obtain good contact with their ECG electrodes. And if the artifact happens, they use all the information available to them to accurately interpret the live ECG. Using all 5 ECG leads to line up the complexes helps identify what is artifact and what are true cardiac complexes. The pressure and plethysmography tracings are also e helpful to confirm the timing of cardiac depolarisation.

References:

Santosh I. Patel, Michael J. Souter, David S. Warner, Mark A. Warner; Equipment-related Electrocardiographic Artifacts: Causes, Characteristics, Consequences, and Correction. Anesthesiology 2008; 108:138–148 doi: https://doi.org/10.1097/01.anes.0000296537.62905.25

Cheng R, Chakravarty T. Piezoelectric electrocardiographic artifact in a patient after surgery with bradycardia and hypotension. Ann Noninvasive Electrocardiol. 2014 Nov;19(6):598-600. doi: 10.1111/anec.12154. Epub 2014 Mar 6. PMID: 24602168; PMCID: PMC6931974.

Garcia-Rubira JC, Sanchez-Medina I, Rodríguez-Velazquez JA, Hidalgo-Urbano R. False ST-segment elevation by artifact due to an infusion pump. J Electrocardiol. 2023 Jul-Aug;79:108-111. doi: 10.1016/j.jelectrocard.2023.03.084. Epub 2023 Apr 3. PMID: 37031631.

A Surgeon and an Interventionalist Walk into a Lab.....

The Hybrid Procedure in Hypoplastic Left Heart Syndrome

Justin Gordon, Queensland Children's Hospital, QLD

Hypoplastic left heart syndrome (HLHS) is a rare congenital heart defect in which the left side of the heart is underdeveloped and unable to support the systemic circulation. HLHS is characterised by marked hypoplasia of the left ventricle (LV) and ascending aorta, with a variable degree of stenosis or atresia of the hypoplastic mitral and aortic valves (Figure 1).

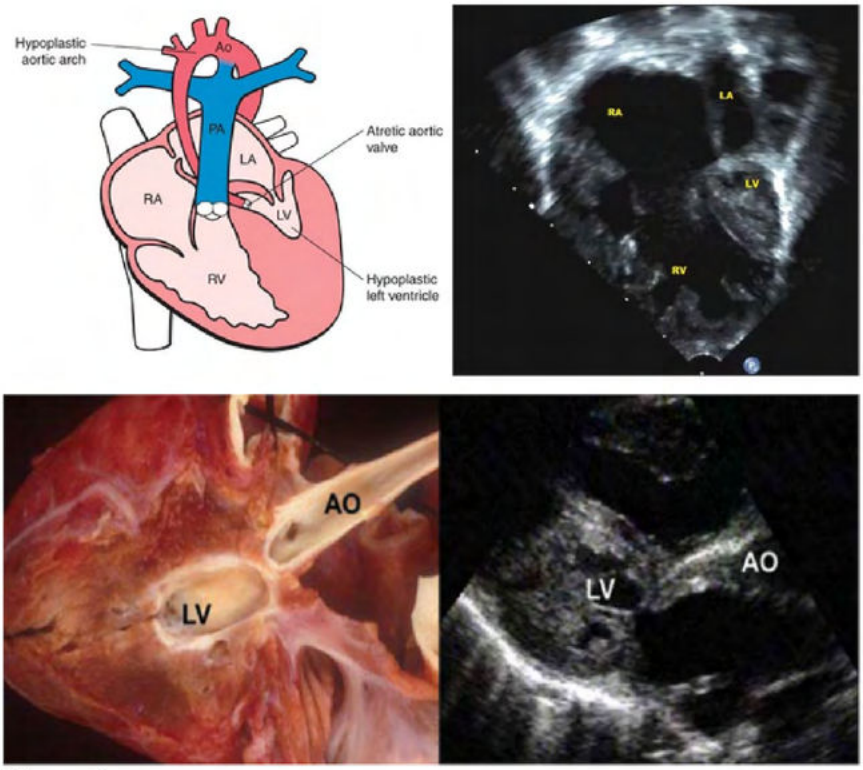


Figure 1

Immediate post-natal survival of HLHS is only viable because of the presence of the patent ductus arteriosus (PDA) at birth. The systemic circulation is supported by the right ventricle (RV) via right-to-left flow through the PDA, with pulmonary venous return reaching the systemic circulation by traversing the atrial septum (via a patent foramen ovale) and entering the RV. Without intervention, the ductus arteriosus naturally closes during the first few days of life and, as a duct dependent systemic lesion, the insufficiency of the left heart is exposed, and systemic circulation fails.

Surgical management of HLHS, using the RV to support systemic circulation, was first achieved by Bill Norwood at Children's Hospital of Philadelphia in 1980. This complex procedure, universally known as the Norwood procedure, has changed the prognosis of the condition that was regarded as fatal only 40 years ago.

The Norwood procedure is the first of three staged operations which separates the pulmonary and systemic circulations, allowing for what is known as a functionally univentricular Fontan palliation (Table 1). Following the three procedures, the RV remains the systemic ventricle while the systemic venous blood is directed to flow passively to the lungs.

AGE	PROCEDURE	Sat O^2	SURVIVAL
Neonate	Norwood procedure – complex bypass surgery	75-89%	80-85%
5-6 months	Stage II procedure – Bidirectional Cavo-pulmonary Connection (Glenn Shunt)	80-85%	95-98%
4-5 years	Stage III procedure – Total Cavo-pulmonary Connection (Fontan procedure)	90-95%	95-98%

Table 1. Hypoplastic Left Heart Syndrome staged palliation procedures.

The Norwood procedure

The aims of the Norwood surgery are to provide unobstructed systemic circulation using the RV, while providing controlled flow to the pulmonary circulation. The first is achieved by removing the atrial septum, reconstructing the aortic arch to remove any hypoplasia or coarctation, and to connect the main pulmonary artery into this reconstructed arch so that the RV ejects directly into the systemic circulation. The controlled and balanced pulmonary flow is achieved through the placement of a small 3-4mm Gore-Tex systemic to pulmonary shunt, such as the Blalock-Thomas-Taussig shunt (BTT shunt), which directs blood flow from the innominate artery to the pulmonary arteries (Figure 2). See Christie Whatley's wonderful article "Renaming the Blalock-Taussig (BT) shunt?" in The Rhythm Strip, Spring 2023.

The first stage Norwood procedure continues to have high morbidity and mortality rates despite continuing advances in pre and post operative management of patients. With this procedure taking place within the first three to seven days postpartum, gestational age, low birth weight and long cardiopulmonary bypass times are considered significant risk factors to interstage survival.
Over the past decade, an alternative approach to the stage I Norwood procedure has emerged which can avoid cardiopulmonary bypass and complicated surgery in fragile neonates. This procedure combines the skills of the surgeon and interventional cardiologist working together in new generation "Hybrid Cardiac Catheterisation Theatres".

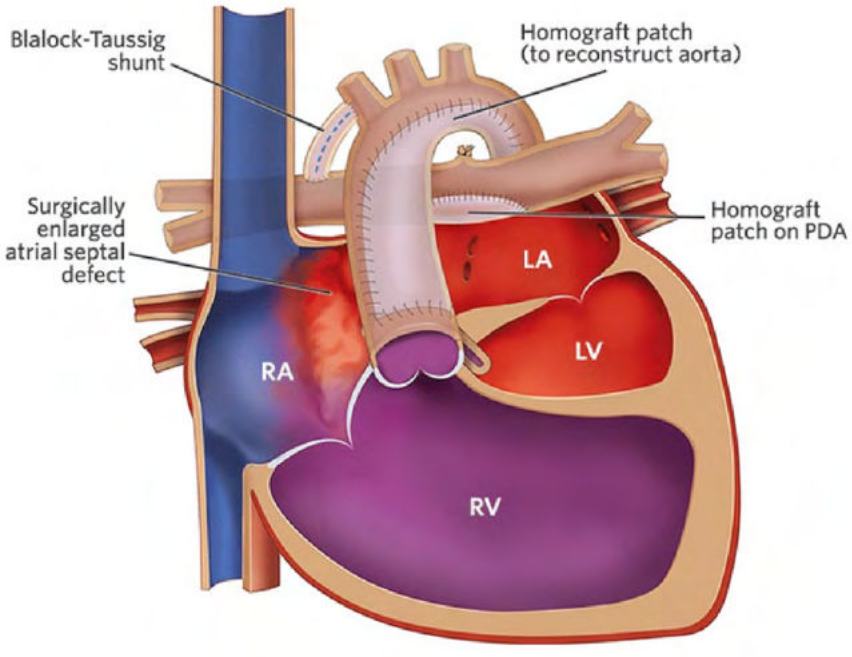


Figure 2. The Norwood procedure for HLHS.
Source: The Children's Hospital Philadelphia

The Hybrid Stage I Procedure for Hypoplastic Left Heart Syndrome

A hybrid stage I palliation for HLHS combines cardiothoracic surgery and interventional transcatheter procedures while avoiding cardiopulmonary bypass. The procedure involves the surgical placement of bilateral branch pulmonary artery bands through a limited median sternotomy followed by direct puncture and sheath placement in the main pulmonary artery for PDA stent deployment. An additional stent may also be placed in the atrial septum to maintain it's patency and allow for unrestrictive left-to-right atrial shunting. The procedure aims to replicate the physiological state of the Norwood procedure with the "bilateral pulmonary artery bands, fashioned out of Gore-Tex material, controlling blood flow to the lungs thereby protecting the pulmonary bed from high flow, whilst the coronary artery sized stent in the PDA maintains systemic cardiac output (Figure 3).

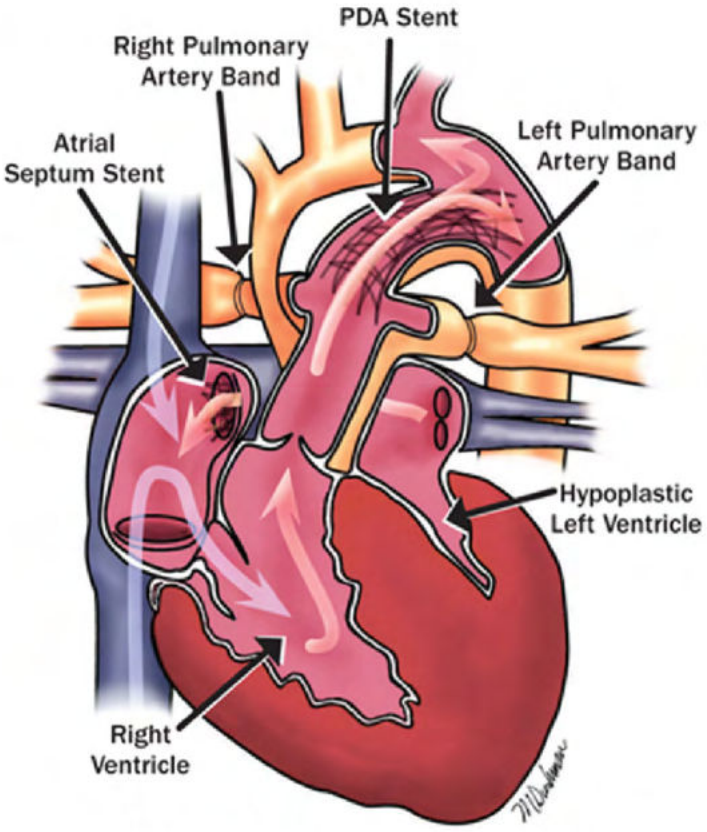


Figure 3. The Hybrid procedure for HLHS palliation

The second stage of palliative surgery following the hybrid procedure, performed at 5-6 months of age in a more robust and stable infant, incorporates removal of the PDA stent and pulmonary artery bands, an atrial septectomy, anastomosis of the diminutive ascending aorta to the main pulmonary artery, aortic arch augmentation, and bidirectional cavopulmonary anastomosis. The Fontan procedure completes the series of palliation at around 4 years of age (Table 1).

Current Practice

At the Queensland Children's Hospital, the Hybrid procedure for HLHS is reserved for patients with low birthweight (less than 2kg), unstable haemodynamics and/or poor ventricular function. The procedure has also been performed on patients with borderline left sided heart structures when an intervention has been necessary but a decision on whether the patient will

continue to a staged single ventricle palliation, or a biventricular repair, is not yet clear (Figure 4). In these instances, if the patient is deemed suitable for a biventricular repair, the PDA stent and PA branch bands can be removed along with any further surgical interventions on the aortic arch or atrial septum at a clinically appropriate time.

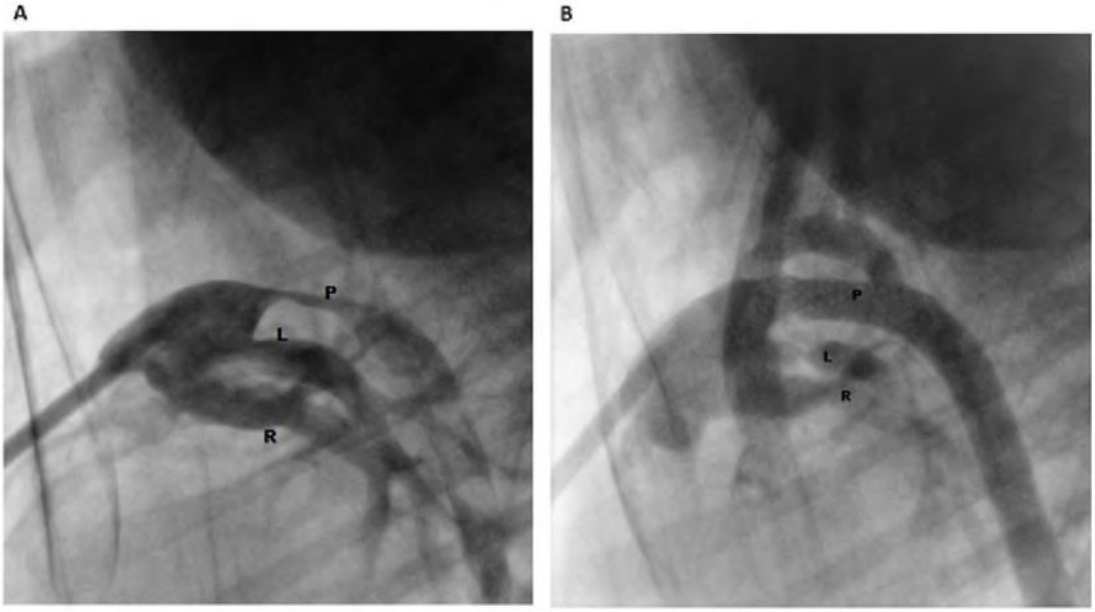


Figure 4. Pulmonary artery angiogram pre branch PA bands and PDA stent (A) and post branch PA bands and PDA stent placement (B).
P – Patent ductus arteriosus (PDA), L – Left pulmonary artery, R – Right pulmonary artery

The Hybrid procedure for HLHS is an innovative combination of simultaneous surgical and interventional procedures to mimic the Norwood palliation physiology while avoiding the insult of long cardiopulmonary bypass times in high-risk neonates. The procedure can be performed in the new generation hybrid cardiac catheterisation suites which combines the surgical requirements of an operating theatre with the imaging and haemodynamic monitoring capabilities of the traditional cardiac catheterisation laboratory.

While the traditional Norwood procedure approach to HLHS remains the gold standard intervention, the use of the Hybrid procedure in our high-risk neonates is becoming an equally successful treatment option. For our patients with Hypoplastic Left Heart Syndrome, the development of the Norwood procedure, along with advances in prenatal diagnosis, pre and post operative intensive care management, and the Hybrid procedure approach, has transformed what was a previously fatal neonatal condition to one in which survival is expected well into adult years.

References:

Barron, D. J., Kilby, M. D., Davies, B., Wright J. G. C., Jones, T. J., Brawn, W. J. Hypoplastic left heart syndrome. Lancet. 2009; 374: 551–6.
Cheatham, S. L., Deyo, G. M. Understanding the hybrid stage I approach for hypoplastic left heart syndrome. Crit Care Nurse. 2016; 36(5): 48-55.
Feinstein, J. A., Benson, D. W., Dubin, A. M., Cohen, M.S., et al. Hypoplastic left heart syndrome, current considerations and expectations. Journal of the American College of Cardiology. 2012; 59(1): S1-S41.

CEPIA EGM series #8

Confounding Results

By Harley Cross, CEPIA

When we are learning EP and specifically the SVT pacing manoeuvres it can be very beneficial to perform as many as possible during an SVT to evaluate the potential responses. However, over time it becomes even more important and beneficial to learn when to limit your pacing manoeuvres to the ones that are going to prove the SVT mechanism beyond a reasonable doubt.

It's all too easy (and fun) from time to time in the EP lab to perform potentially unnecessary pacing manoeuvres. We are all guilty of this.

Why is this a bad a thing?

Well apart from potentially adding extra time to the procedure, the results from some pacing manoeuvres can produce confounding results that can add confusion to an already confusing area, especially when learning. A great example of this is para-Hisian pacing (PHP).

Let's look at Figure 1 that demonstrates attempted PHP. The first two paced beats must be ignored because they are pseudo fused with the antegrade sinus rhythm. However, beats 3, 4 & 5 demonstrate an eccentric retrograde atrial activation (CS3,4 early) with a VA time of 130ms and a wide QRS. Beat 6 shows a slightly narrower QRS with a change in atrial activation from eccentric to concentric (CS 9,10 early) along with shortening of the VA time to 104ms.

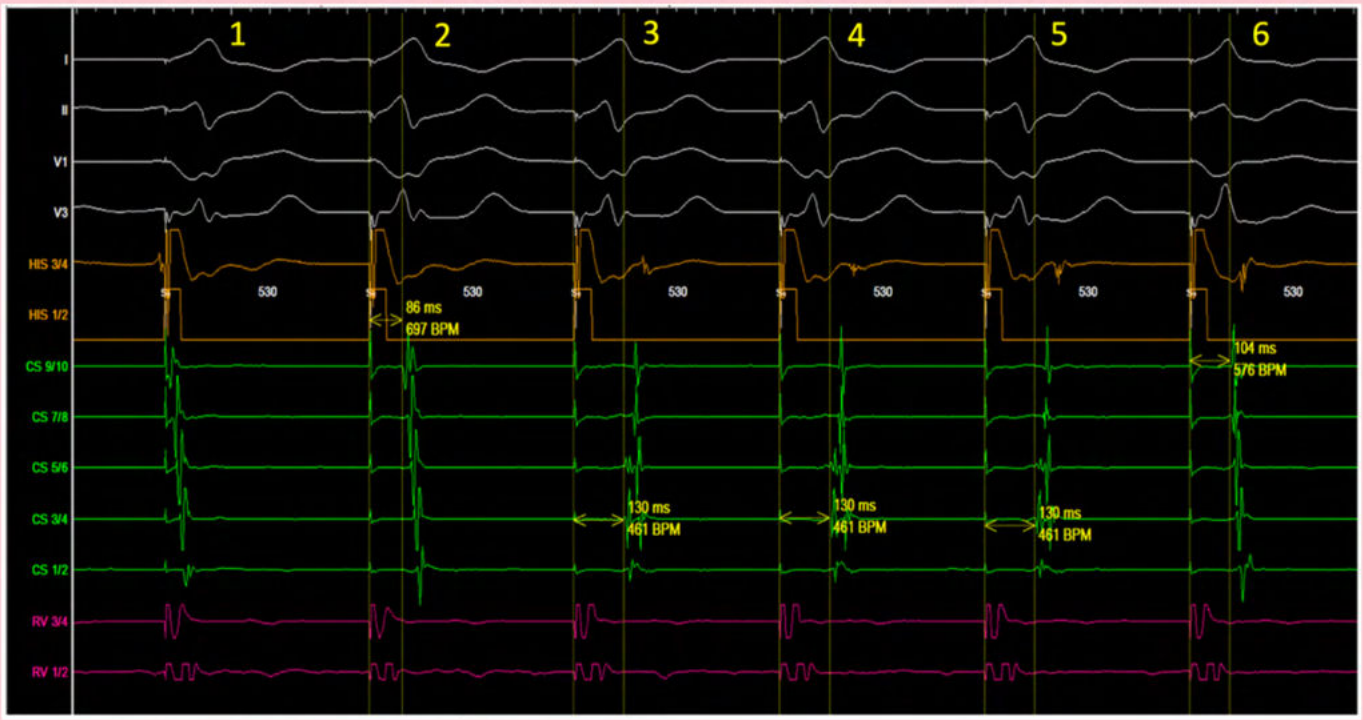


Image courtesy of Karlie Chambers (Monash Health)
Figure 1: Para-Hisian pacing demonstrating a change in both QRS duration & atrial activation.What does this mean?

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Eccentric atrial activation as we know is highly suggestive of a bypass tract. However, if we ignore the atrial activation for a minute and focus only on the Stim-A time (SA) this response is most consistent with a nodal response (see Figure 2). If no bypass tract is present the SA time is longer when only the RV is captured (wider QRS). This is because the wavefront must travel antegrade to the distal right bundle branch before making its way back to the atria by way of the His/AV node. Whereas atrial activation in the presence of a concealed septal bypass tract only requires myocardial capture, therefore the SA time is the same regardless of QRS width i.e., His + RV or RV only capture.

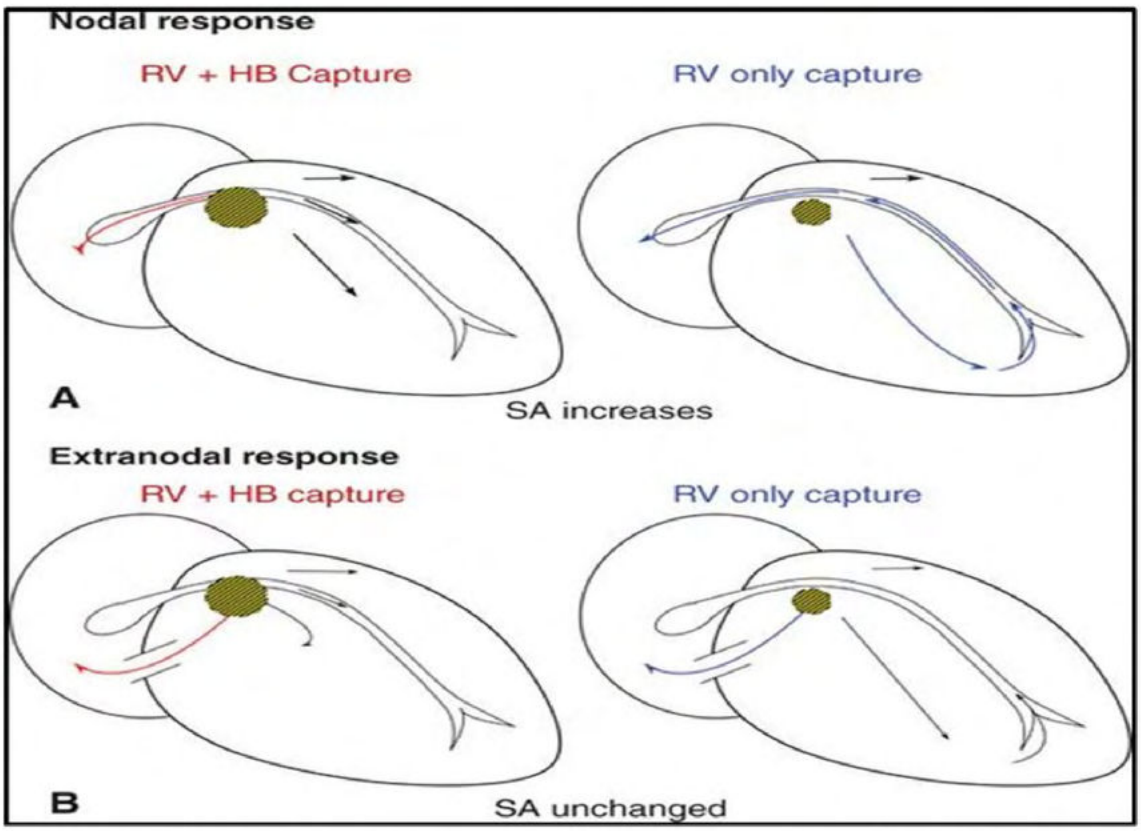

Figure 2: Top panel (A): SA increases with loss of HB capture. Bottom panel (B): SA remains the same for both RV only and RV + HB capture in concealed septal accessory pathways.

PHP can be extremely helpful in the right circumstances. Outside of these circumstances the responses can be confounding and often lead to more confusion.

As a rule, PHP should be reserved for suspected concealed septal bypass tracts and not used when there is a suspected free wall bypass tract. Figure 3 from the same case confirms the presence of a left postero-lateral bypass tract insertion. Yet PHP has yielded a paradoxical nodal response.

Why?

Are there two pathways? No. It's a simple case of distance of the bypass tract from the pacing catheter located at the His compared to the AV node. In the setting of a septal pathway the AV node and bypass tract are similar distance to the pacing catheter. This is what causes the similar SA times. Whereas a postero-lateral or any free wall bypass tract is a lot further away from the pacing catheter compared to the AV node. So, when both the His and RV are captured, the atria are activated retrogradely by way of the His/AV node, which as we remember is

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close to the pacing catheter. The SA time will be relative short. When only the RV is captured, the wavefront must now travel slowly to the distal bundle branch insertions then retrogradely back to the atria via the bypass tract and AV node. The bypass tract was faster than the AV node in this case resulting in an eccentric pattern but still resulting in a longer SA time compared to His + RV capture.

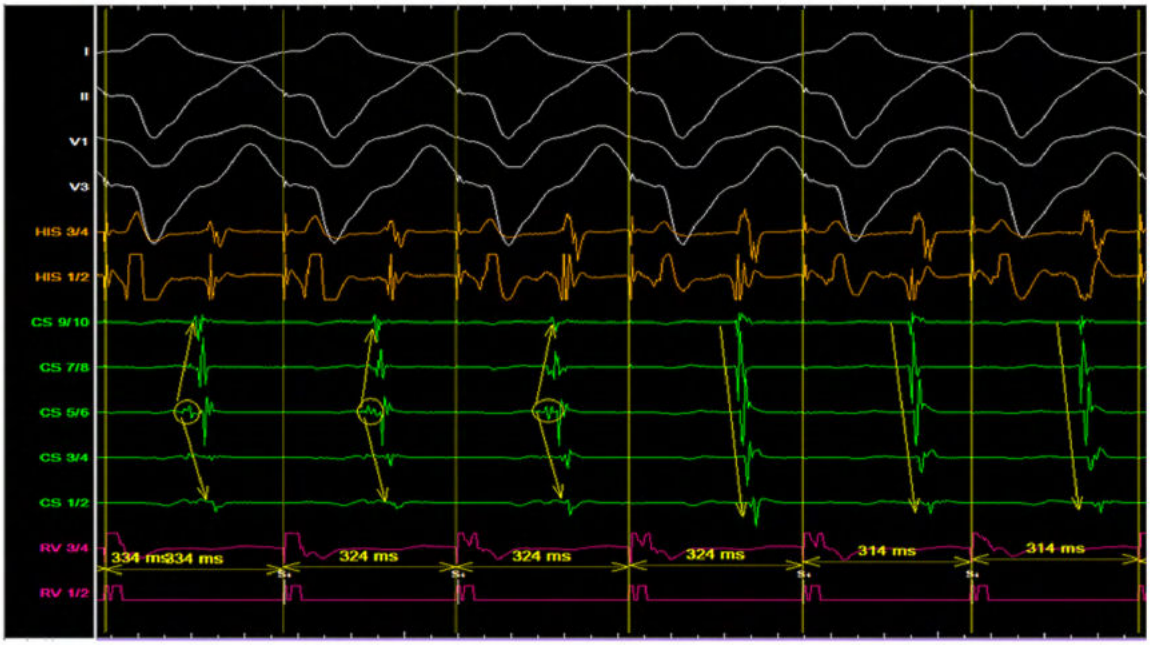

Image courtesy of Karlie Chambers (Monash Health)
Figure 3: Change in atrial activation from eccentric to concentric i.e., bypass tract to AV node. Bypass tract location confirmed to be left postero-lateral (~4 o'clock MA).

We must always consider several factors when interpreting PHP as paradoxical responses can occur. The distance between the AV node, bypass tract and pacing catheter is just one example. Dual AV node physiology, pure His capture and the conduction velocity of the AP and AVN can also lead to misleading responses.

In summary, it's important to know when to use certain pacing manoeuvres. Equally important is recognising when certain pacing manoeuvres show paradoxical and confounding responses. In this case it was lucky a coronary sinus catheter was used. Without that the response seen may have missed a concealed bypass tract. Eccentric atrial activation (via the CS) is the most effective way to identify left free wall bypass tracts. Septal bypass tracts demonstrate concentric activation and often require further testing to confirm the presence.

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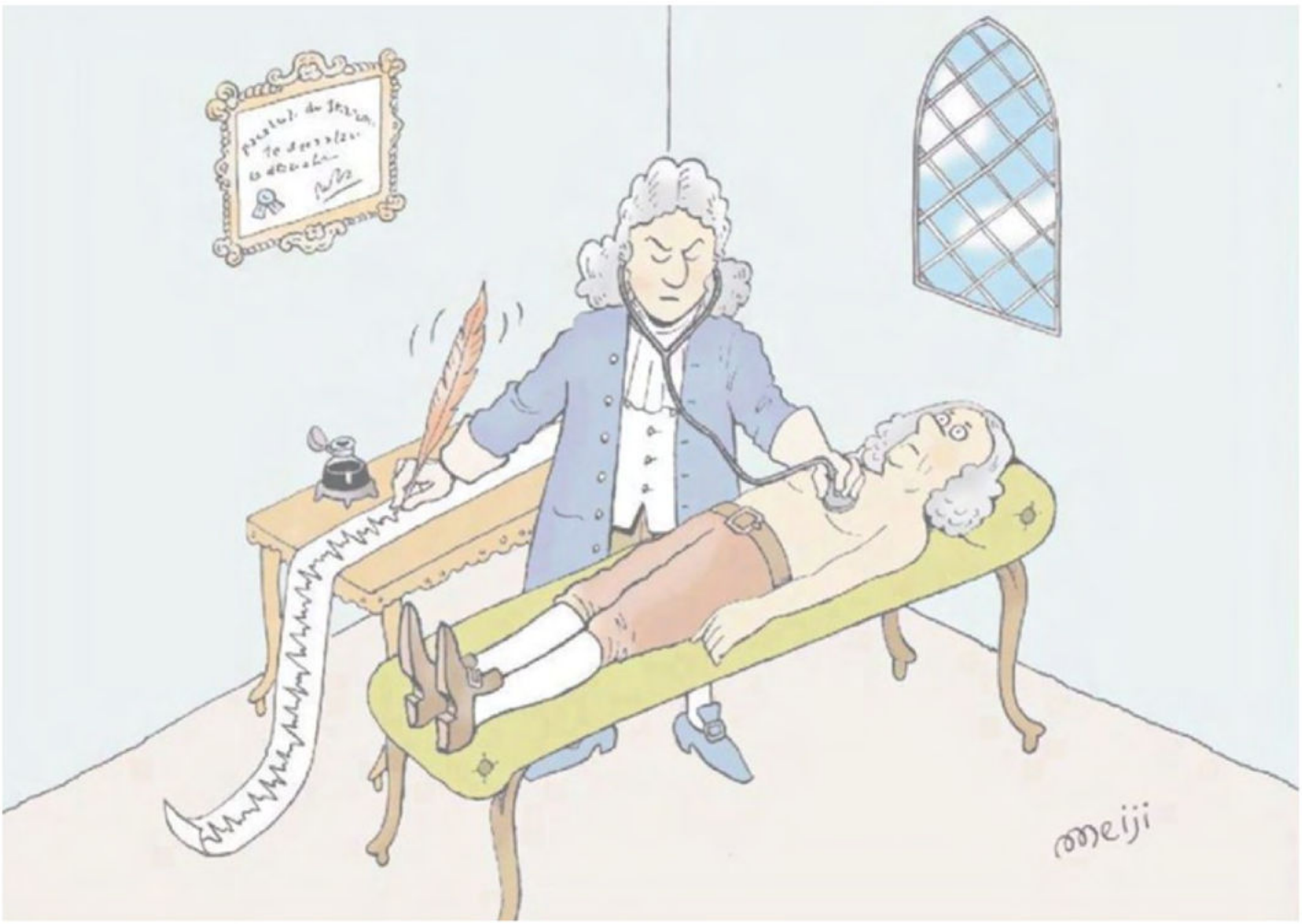
Uh Oh - Looking for "ECG of the Week" by Malcolm Dennis? We have taken a small break from Malcolm's series, please keep an eye out for them next edition of The Rhythm Strip! 👀



Height and Weight Tables

Feet / Inches	Centimetres
1 foot	**30**
1 inch	**2.5**
4'3"	130
4'4"	132
4'5"	135
4'6"	137
4'7"	140
4'8"	142
4'9"	145
4'10"	147
4'11"	150
5'0"	152
5'1"	155
5'2"	158
5'3"	160
5'4"	163
5'5"	165
5'6"	168
5'7"	170
5'8"	173
5'9"	175
5'10"	178
5'11"	180
6'0"	183
6'1"	185
6'2"	188
6'3"	191
6'4"	193

Feet / Inches	Centimetres
6'5"	196
6'6"	198
6'7"	201
6'8"	203
6'9"	206

Stones/Pounds	Kilograms
1 stone	**6.4**
1 pound (lb)	**0.5**
6 stone 4 lb	40
7 stone 1 lb	45
7 stone 12 lb	50
8 stone 9 lb	55
9 stone 6 lb	60
10 stone 3 lb	65
11 stone 0 lb	70
11 stone 11 lb	75
12 stone 8 lb	80
13 stone 5 lb	85
14 stone 2 lb	90
14 stone 13 lb	95
15 stone 10 lb	100
16 stone 7 lb	105
17 stone 4 lb	110
18 stone 1 lb	115
18 stone 12 lb	120
19 stone 10 lb	125
20 stone 7 lb	130

HR ⟷ Cycle Length Table

Heart Rate	Cycle length
20	**3000**
22	2727
24	2500
26	2308
28	2143
30	**2000**
32	1875
34	1765
36	1667
38	1579
40	**1500**
42	1429
44	1364
46	1304
48	1250
50	**1200**
52	1154
54	1111
56	1071
58	1034
60	**1000**
62	968
64	938
66	909
68	882
70	**857**
72	833
74	811
76	789
78	769
80	**750**
82	732
84	714
86	698
88	682
90	**667**
92	652
94	638
96	625
98	612
100	**600**
102	588
104	577
106	566
108	556
110	**545**
112	536
114	526
116	517
118	508
120	**500**

Heart Rate	Cycle length
122	492
124	484
126	476
128	469
130	**462**
132	455
134	448
136	441
138	435
140	**429**
142	423
144	417
146	411
148	405
150	**400**
152	395
154	390
156	385
158	380
160	**375**
162	370
164	366
166	361
168	357
170	**353**
172	349
174	345
176	341
178	337
180	**333**
182	330
184	326
186	323
188	319
190	**316**
192	313
194	309
196	306
198	303
200	**300**
202	297
204	294
206	291
208	288
210	**286**
212	283
214	280
216	278
218	275
220	**273**
222	270

Heart Rate	Cycle length
224	268
226	265
228	263
230	**261**
232	259
234	256
236	254
238	252
240	**250**
242	248
244	246
246	244
248	242
250	**240**
252	238
254	236
256	234
258	233
260	**231**
262	229
264	227
266	226
268	224
270	**222**
272	221
274	219
276	217
278	216
280	**214**
282	213
284	211
286	210
288	208
290	**207**
292	205
294	204
296	203
298	201
300	**200**
302	199
304	197
306	196
308	195
310	**194**
312	192
314	191
316	190
318	189
320	**188**
322	186
324	185

Maximum Heart Rate Table

Birth Year	Age at Birthday	85% Max HR	Max HR 220-age
1920	**104**	**99**	**116**
1921	103	99	117
1922	102	100	118
1923	101	101	119
1924	100	102	120
1925	**99**	**103**	**121**
1926	98	104	122
1927	97	105	123
1928	96	105	124
1929	95	106	125
1930	**94**	**107**	**126**
1931	93	108	127
1932	92	109	128
1933	91	110	129
1934	90	111	130
1935	**89**	**111**	**131**
1936	88	112	132
1937	87	113	133
1938	86	114	134
1939	85	115	135
1940	**84**	**116**	**136**
1941	83	116	137
1942	82	117	138
1943	81	118	139
1944	80	119	140
1945	**79**	**120**	**141**
1946	78	121	142
1947	77	122	143
1948	76	122	144
1949	75	123	145
1950	**74**	**124**	**146**
1951	73	125	147
1952	72	126	148
1953	71	127	149
1954	70	128	150
1955	**69**	**128**	**151**
1956	68	129	152
1957	67	130	153
1958	66	131	154
1959	65	132	155
1960	**64**	**133**	**156**
1961	63	133	157
1962	62	134	158
1963	61	135	159
1964	60	136	160
1965	**59**	**137**	**161**
1966	58	138	162
1967	57	139	163
1968	56	139	164
1969	55	140	165
1970	**54**	**141**	**166**

Birth Year	Age at Birthday	85% Max HR	Max HR 220-age
1970	**54**	**141**	**166**
1971	53	142	167
1972	52	143	168
1973	51	144	169
1974	50	145	170
1975	**49**	**145**	**171**
1976	48	146	172
1977	47	147	173
1978	46	148	174
1979	45	149	175
1980	**44**	**150**	**176**
1981	43	150	177
1982	42	151	178
1983	41	152	179
1984	40	153	180
1985	**39**	**154**	**181**
1986	38	155	182
1987	37	156	183
1988	36	156	184
1989	35	157	185
1990	**34**	**158**	**186**
1991	33	159	187
1992	32	160	188
1993	31	161	189
1994	30	162	190
1995	**29**	**162**	**191**
1996	28	163	192
1997	27	164	193
1998	26	165	194
1999	25	166	195
2000	**24**	**167**	**196**
2001	23	167	197
2002	22	168	198
2003	21	169	199
2004	20	170	200
2005	**19**	**171**	**201**
2006	18	172	202
2007	17	173	203
2008	16	173	204
2009	15	174	205
2010	**14**	**175**	**206**
2011	13	176	207
2012	12	177	208
2013	11	178	209
2014	10	179	210
2015	**9**	**179**	**211**
2016	8	180	212
2017	7	181	213
2018	6	182	214
2019	5	183	215
2020	**4**	**184**	**216**

"What day of the week was that?"

A tool to help match CIED event history with patient symptoms

2023

January

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

February

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

March

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

May

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

June

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

July

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

August

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

December

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

2024

January

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

March

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

April

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June

Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Newsletter Article Submission deadlines

Submissions are due on the 4th Sunday of the 2nd month of each season

Winter 2024	Sunday 28th of July 2024
Spring 2024	Sunday 27th of October 2024
Summer 2025	Sunday 26th of January 2025
Autumn 2025	Sunday 27th of April 2025

Authors can claim CPD points for contributing to this newsletter.
Submissions should be emailed to secretary@picsa.org.au

"Hello my name is ... I am a Cardiac Physiologist"

One very easy way to promote the visibility, recognition and regulation of the Cardiac Physiology profession is to simply introduce ourselves, and state what we are, using the recommended title "Cardiac Physiologist". We can all do this – regardless of whether or not our employer has updated our statement of duties in line with the national recommendation.
Simply introducing ourselves correctly will educate those around us about our professional identity. It seems like a simple small thing, but it is a very powerful way to connect with patients and to advance our profession.

Remember to always say **"Hello my name is ... I am a Cardiac Physiologist"**

More information can be found in on this page located on our website
https://picsa.org.au/about/#core-documents

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PiCSA Online Education Portal (members only)
https://www.picsa.org.au

Cardiac Electrophysiology Institute of Australia (CEPIA)
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Cardiac Physiology in Practice
Online ECG course
https://cardiacphysinpractice.com/

Echo Ed online education
https://echoedonline.com.au

Echo Supervisors Summit
https://echosupervisor.com/

Australasian Sonographers Association (ASA)
www.sonography.org

Australasian Society for Ultrasound in Medicine
https://connect.asum.com.au/home
1-3 November 2024
Brisbane

CSANZ ASM
https://www.csanzasm.com/
1-4 August 2024
Perth Convention and Exhibition Centre, Perth

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Thank you for reading