



## **Coroners Court of Victoria**

# **Aortic Dissection Investigation: Engagement of Clinical Expertise to Understand the Phenomenon**

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# A reconstructed “journey”

- From Magistrate to Coroner – the learning curve
- Medical terminology abbreviations - “abdominal aortic aneurysm” or AAA, less common “thoracic aortic aneurysm” and “aortic dissection” or AD
- Classically, “a death that appears to have been unexpected...” and therefore by definition “reportable” [s4 Coroners Act 2008]
- Relatively common for coroners, but not common clinically, arguably “rare”. AAA/AD rate 2-4/100,000 population/year. In Victoria with population of 5,000,000 equates to ~100-200/year, not all reportable
- Significant number of deaths but compare with total reportable deaths (6,500), suicides annually (550 and stable for several years) and road fatalities (300 trending down over a number of years)



# Is there scope for “prevention”?

- Typically catastrophic event, person dies at home either alone or with such rapid onset of symptoms that death inevitable
- Several deaths where early symptoms, sudden onset pain/other symptoms lead person to seek medical attention but misdiagnosed – missed opportunity for prevention
- Three deaths under investigation at the one time – Salvatore ACCARDO, Iman KASSIS and Constandia PETZIERIDES. For number of reasons, not amenable to hear as a “cluster”
- Chose PETZIERIDES as “index” or representative case –discussed by Professor George Jelinek and Dr Sandra Neate
- Report requested from the Coroners Prevention Unit (CPU) to understand how often AD misdiagnosed and why



# Is there a problem?

- CPU reviewed data in National Coronial Information System (NCIS):
  - 137 deaths attributed to AD 2010-2012 (44+47+46)
  - Of these, 19 deaths where deceased sought medical attention proximate to death (2 on day of death, 6 day before, 9 b/w 2-10 days before, and 2 >10 days before)
  - Of 19 deaths, chest pain a feature in 11, back pain in 3, chest & back pain in 3, and in only 2 no complaint of chest or back pain
  - AD NOT diagnosed in ANY of the 19; 3 diagnosed with “pinched nerve”, 1 discharged after exclusion of heart disease, diagnoses of remaining 15 not recorded
- Based on CPU report I inferred potential to contribute to a reduction in number of preventable deaths by investigating Mrs Petzierides’ death with a focus on any systemic issues or impediments to diagnosis of AD on presentation to emergency departments (EDs)



# Tailoring an approach

- Directions Hearing – bringing the family along
- Choice of independent expert witness – an experienced Emergency Physician
- Broader than usual brief – assess clinical management, assessment of clinical management and care provided to Mrs Petzierides in the ED, a literature review of the incidence of AD and differential diagnoses, and advice as to world's best practice protocols
- Comprehensive, scholarly yet accessible and practical 56-page report, salient excerpts from which were attached to the finding
- Round-table meeting of clinicians to inform recommendations and comments...



# Legislative context

“The coronial system of Victoria plays an important role in Victorian society. That role involves the independent investigation of deaths and fires for the purpose of finding the causes of those deaths and fires and to contribute to the reduction of the number of preventable deaths and fires and the promotion of public health and safety and the administration of justice...”

Preamble to Coroners Act 2008: operational from 1 November 2009



# Others aspects Coroners Act 2008

The purposes of the Act include in s1(c)

“to contribute to the reduction of the number of preventable deaths and fires through the findings of the investigation of deaths and fires, and the making of recommendations”

The objectives include in s7

“...intention of Parliament that a coroner should liaise with other investigative authorities, official bodies or statutory officers to avoid unnecessary duplication of inquiries/investigations; and expedite...”

Factors to be regarded as far as possible when exercising a function under the Act are set out in s8 – consistent with therapeutic jurisprudence – including recognising that

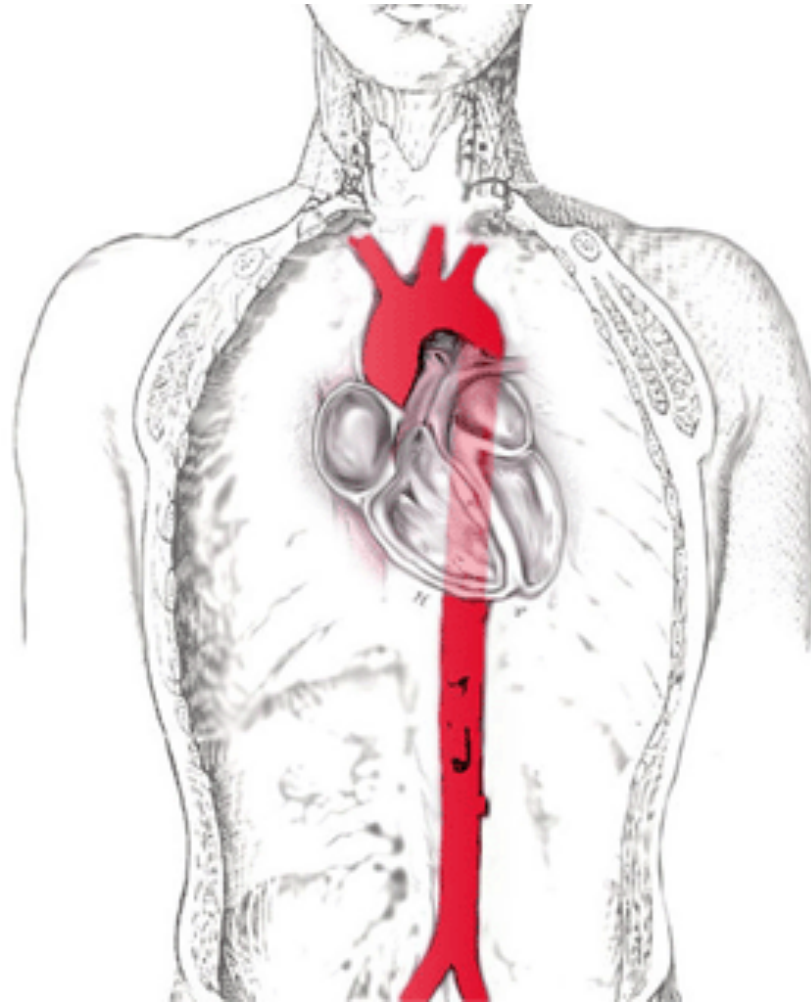
- unnecessarily lengthy or protracted coronial investigations may exacerbate the distress of family, friends and others affected by the death
- a need to balance the public interest in protecting a living or deceased person’s personal or health information with the public interest in the legitimate use of that information
- desirability of promoting public health and safety and the administration of justice

The CCOV is established as an “inquisitorial court” (s89) and a coroner holding an inquest is not bound by the rules of evidence and may be informed and conduct an inquest in any manner that the coroner reasonably thinks fit (s62(1))

Coroners are empowered to “comment” or “make recommendations to any Minister, public statutory authority or entity” on any matter connect with a death, including public health and safety and the administration of justice, and to report to the Attorney-General (at large).



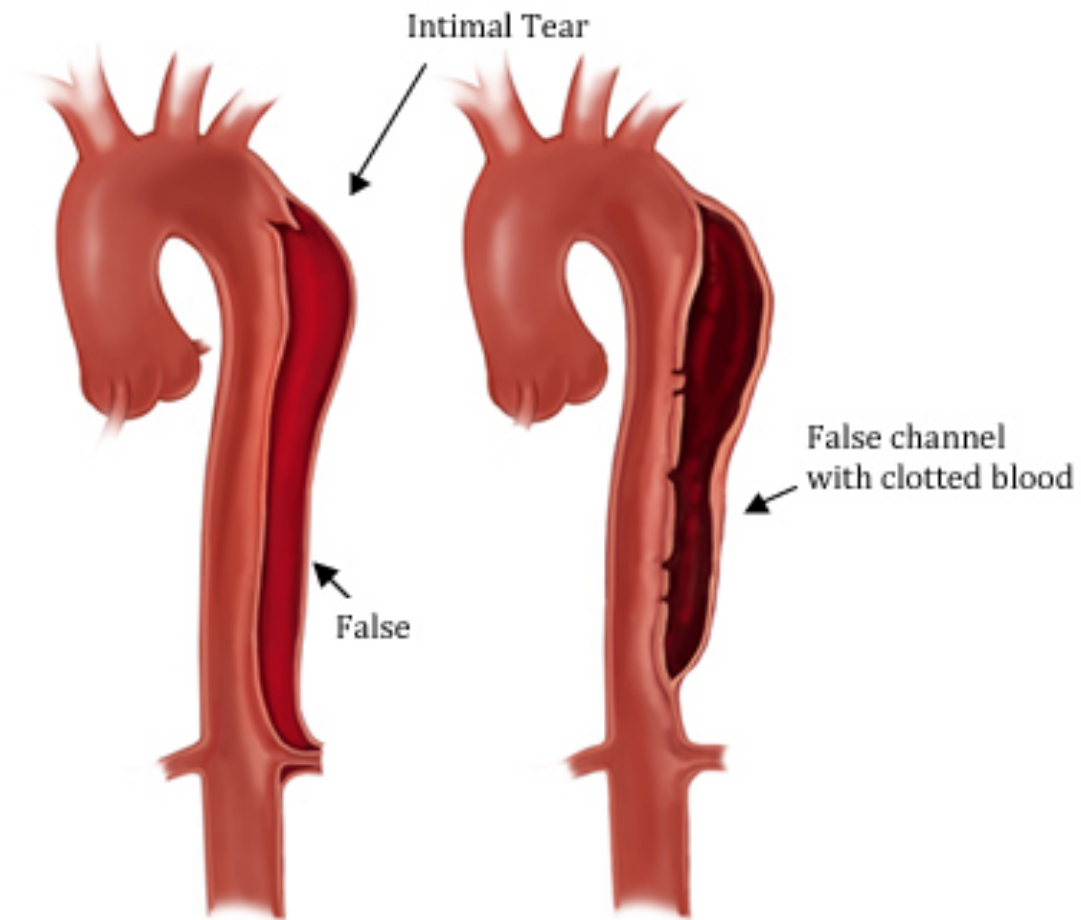
# Anatomy





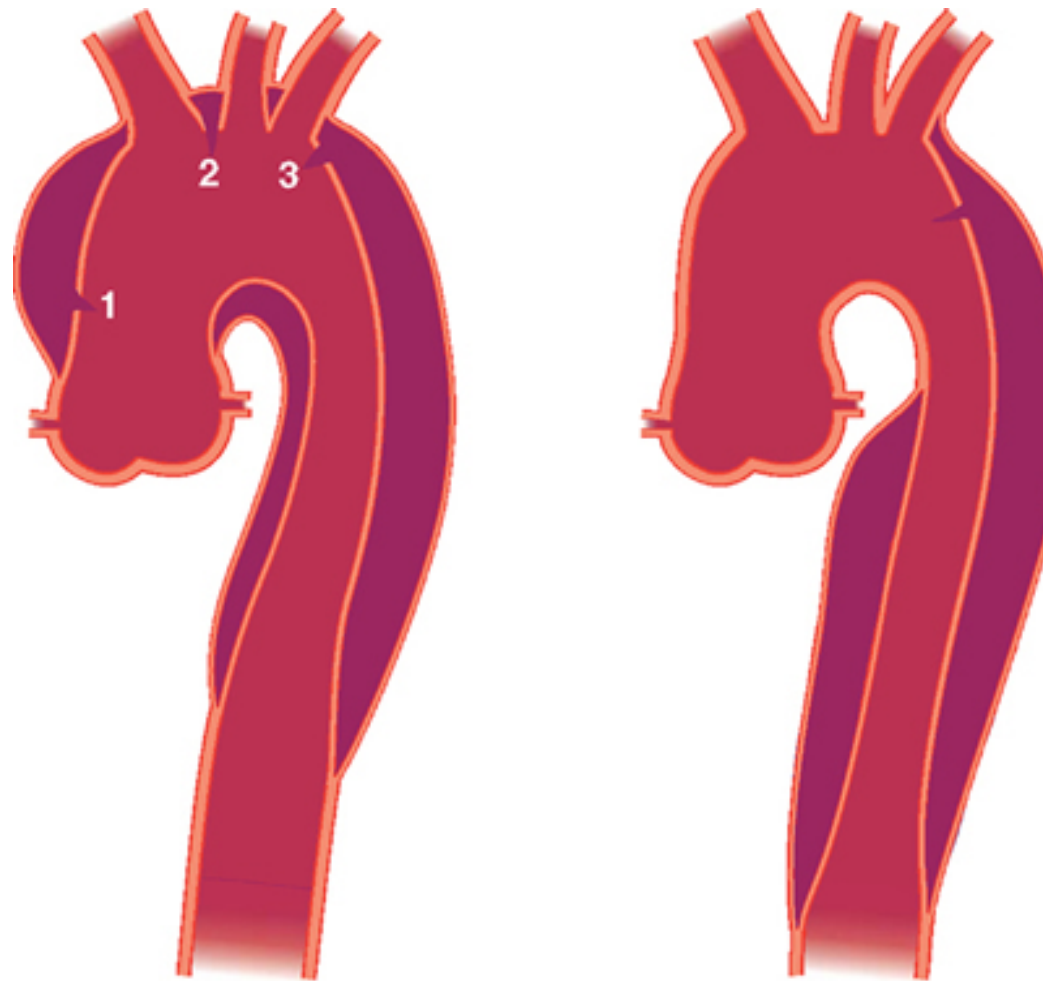


# What is AD?





# Types of AD



**Type A**

**Type B**



# Aortic dissection – what we know

- Rare condition clinically
- International Registry of Acute Aortic Dissection (IRAD) 2000
  - Incidence 3 per 100,000
  - Overall mortality 27%
- Difficult to diagnose in ED
- Missing the diagnosis can be fatal
- Most commonly presents as chest/back pain but other causes of chest/back pain far more common



# Aortic dissection

- Canadian Medical Protection Agency 2011 recognised the difficulty in diagnosis
  - “...inappropriate reliance on classic features such as tearing chest pain, blood pressure/pulse discrepancies, new cardiac murmurs, and chest radiograph mediastinal widening.”
  - Poor reliability of symptoms and physical findings in determining likelihood (12% have no pain!)
  - BP differential between arms of  $>20\text{mm}$  a predictor but
    - 20% of normal patients have  $>20\text{mm}$
    - 50% of normal patients have  $>10\text{mm}$



# Aortic dissection

- Canadian Medical Protection Agency 2011
  - Someone with tearing back pain, aortic incompetence, BP difference of 35mm, and widened mediastinum has AD, but rarely present, and someone with none of them might
  - While there are some risk factors, the ED physician has to always consider the diagnosis, and then decide how far to go in ruling it out
- Conclusion
  - Classic description rare; absence of classic description does not equal no AD



# Context

- Can't discuss AD without discussing chest pain
- CP one of most common ED presentations
  - 10% of 7 million annual ED visits are for CP
  - 700,000 Australians annually to be assessed and correctly diagnosed, managed and referred
- Extremely common, daily challenge for ED physicians



# Background

- Incidence of MI (myocardial infarction) 800x that of AD
  - Average ED physician may see 1-2 ADs over career or mostly none
- Treatment for MI highly time-dependent so some urgency to treat, BUT
  - Usual treatment for MI can be disastrous for AD
  - 71% mortality in AD misdiagnosed as MI
- Pathways designed for the detection/rule out of ACS can steer clinicians away from considering AD



# Scenario

- Present Mrs P with actual clinical scenario from inquest
- Use an emergency physician as an expert commentator throughout the case
- Show data from what actually happened, frequent stops to question expert EP on what was done and what she would have done





# Mrs Petzierides

- 74yo woman living at home with family
  - Woke 0015hrs, sudden severe left sided pain upper chest posteriorly, radiating to jaw, sharp, heavy, nauseated, never before, son rang 000
  - History of hypertension, mild/moderate coronary artery narrowing on angiogram, atrial fibrillation
  - Meds: Warfarin, telmisartan, felodipine
  - No FH, non-smoker



## Ambulance 0022hrs

- Woke with pain in the left side of the chest posteriorly, radiating to both jaws, nausea, sweating
- Nil to find on examination
- Initial assessment: “ischaemic chest pain, ??? aneurysm (thoracic) dissection”
- Called MICA ambulance to take over



## MICA ambulance 0030hrs

- Sudden 10/10 left scapular pain, to jaw, sharp and heavy, nausea, never before
- Vomited X1 after ambulance arrival
- Progressive dizziness en route
- ECG: 48/min, atrial fibrillation, T wave inversion lead 1 (“ischaemic pattern”)
- Initial assessment: ACS NSTEMI for Ix



# MICA treatment

- Monitor, IV, morphine x4 doses to 15mg total
- Bilateral BP taken, metoclopramide, aspirin (“delay in administration whilst further questioning re potential aortic involvement”)
- Significant increase in pain prior to arrival
- Arrived at hospital ED 0104 hrs



## Questions for expert EP

- What do you make of the ambulance and MICA assessments?
- What are the issues identified in this pre-hospital assessment?
- What are your comments regarding the management to date?



## ED triage 0107hrs

- Chest pain into jaw, originates in shoulder blade, sharp pressure, “pain down from 5 to 2 with GTN”
- Now patient complains of “pain all over”
- Vital signs
  - PR 52, RR 22, SaO2 98% on 8L/min O2
- Nil distress
- Triage category 2



## Nursing assessments 0125hrs

- Sudden onset left scapular pain radiating to jaw, stabbing, pressure, nausea
- Obs charted regularly
- “Unable to use pain score”
- No further pain reported after 0143hrs
- Medical assessment at 0250hrs (1hr 46mins after arrival)



## Questions for expert EP

- What are the issues identified in this triage assessment?
- Is triage category 2 appropriate?
- What factors may have affected time to medical assessment?
- How much time has elapsed and what has occurred between the time of call to 000 and medical assessment?





## Expert EP to assess Ms P

- How would you assess Ms P?
- What features of pain are you looking for? Why?
- What is the most likely diagnosis at this stage?
- What other potentially important diagnoses need to be considered?
- What is the most important issue about recognising AD at this stage?



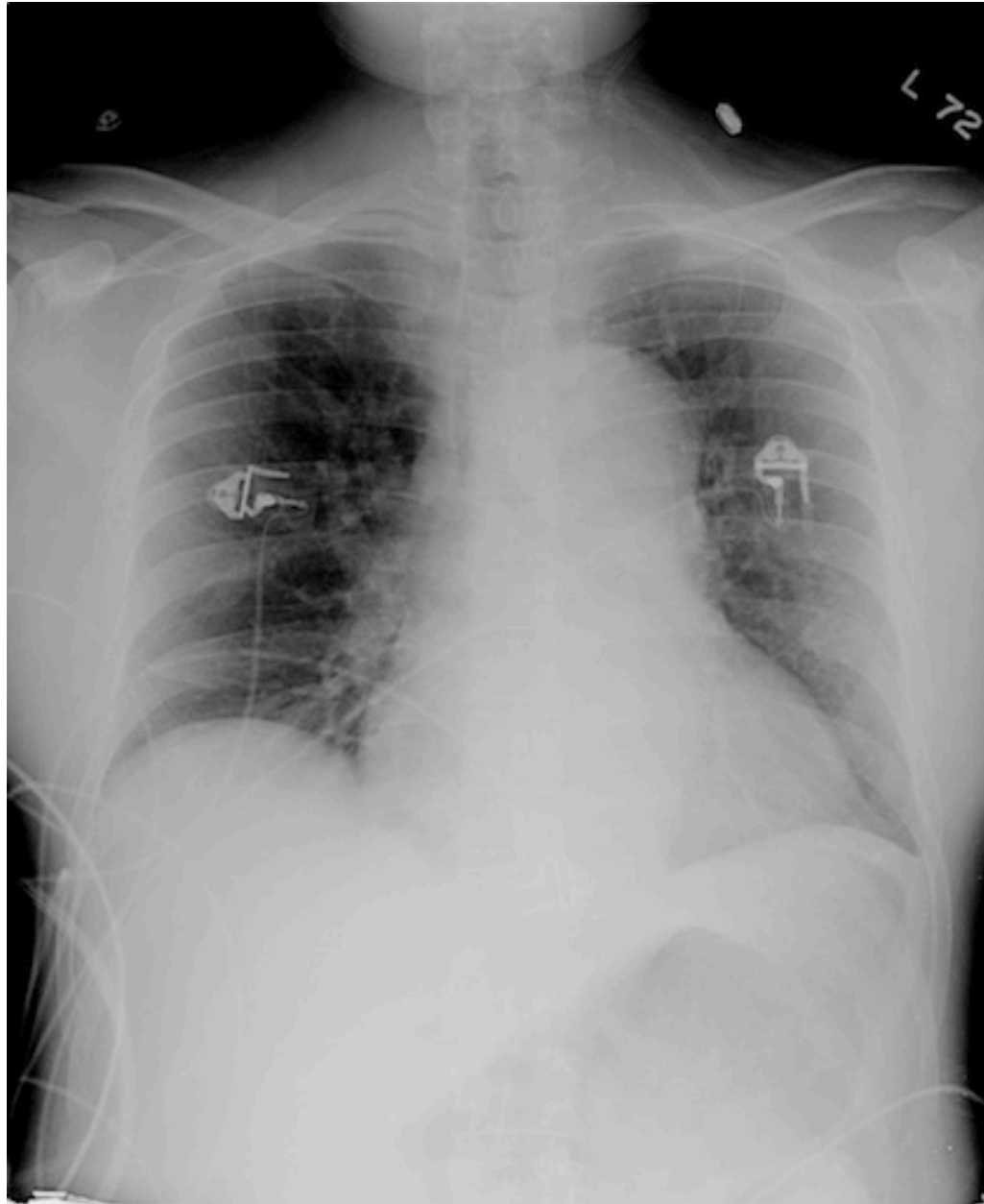
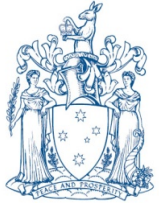
## Medical assessment 0250hrs

- Sudden 10/10 left scapular pain, sharp, to both jaws, nausea
- Pain settled with morphine 15mg, now pain-free
- Examination
  - Looks well
  - Chest and heart normal
  - “Point tenderness over left medial scapula”
- ECG: old inferior/antero-lateral ST changes



# Investigations

- FBE normal
- U/Es normal
- Troponin 0.02 (<0.03 normal)
- INR 2.3
- Chest X-ray: cardiomegaly, no pneumothorax (reported later as “heart is markedly enlarged...)





## Diagnosis and plan

- Impression: musculoskeletal pain
- Plan: Repeat troponin 0600hrs, if normal home with LMO to arrange outpatient stress test
- Repeat troponin 0.03
- Discharge 0730hrs



# Questions for EP

- What do you make of the point tenderness over the scapula?
- Do you consider the overall impression reasonable?
- Has the doctor adequately considered all serious causes of chest pain?
- Has there been a reasonable attempt to exclude other serious causes of chest pain?
- Has the chest pain pathway been appropriately applied?
- What do you make of the plan? Is sending her home with GP follow up best practice?



# Questions for EP

- What are *your* main differential diagnoses now?
  - What features of the presentation do you give weight to in making this differential list?
- When should serious possible diagnoses other than ACS (PE, AD) be more definitively excluded in the ED?
- How will you narrow down the possibilities?
  - What tests would you order?



# Excluding dissection: balancing risks and benefits

- Should the ED doctor have investigated aortic dissection before discharge?
- What about using d-Dimer?
- Why not just do all the tests for patients with chest pain and be sure?
  - CT with contrast, MRI or TOE
    - How available are these?
    - How sensitive/specific?
    - Risks and logistics of testing





# Outcome

- After lunch, Ms P found collapsed in bathroom, unresponsive
- MICA called
- Agonal breathing, no pulse
- Initial response to resuscitation with return of circulation, but then lost cardiac output
- Deceased 1338hrs same day
- Reported to coroner → inquest



## Medical examiners report

- Aorta: “posterior-inferior wall tear of aorta around the arch associated with haemorrhage behind the aorta and into the left thorax. There is a second tear which is horizontal just above the aortic valve(s) measuring 35mm in length.”
- Pleural cavities: “1500ml of blood in left pleural cavity and 100 ml in right pleural cavity.”
- Cause of death: I(a) Haemothorax, I(b) Dissecting thoracic aorta



## Issues raised in expert opinion

- Communication of ambulance information
- Diagnostic decision making
- The restrictive role of clinical pathways
- The role of admission and short-stay medicine units



# Round Table

- After inquest, Clinical Directors of EDs across Melbourne and Geelong invited by Manager of Health and Medical Investigation Team (HMIT, now CPU) on behalf of coroner to Round Table
- Once invitation accepted, participants sent CPU report, Dr Eddey's report and a case outline
- Meeting took place in court, participants, including Coroner sat around bar table, discussion scribed but not recorded, ran for 2.5 hours, no formal agenda or structure but deft facilitation by Prof Jelinek & Dr Neate. Dr Eddey an important participant.
- Frank and open discussion encouraged and several consensus views emerged – documented in the finding
- Petzierides family barrister invited to attend as an observer, but not a participant. He declined, but as promised, family provided with summary of the discussion, prior to delivery of the finding
- Evaluation of the process?



# The ripple effect

- Immediately after Round Table, Professor Jelinek invited to speak at Department of Health Emergency Forum
- Positive comments to participating court personnel
- Submission/acceptance of paper on Round Table to the Medical Journal of Australia
- Recommendations made to Australasian College for Emergency Medicine (ACEM), Minister for Health/ Secretary and Ambulance Victoria
  - Positive responses
- Further research undertaken by CPU on last 10 years AD
  - Another paper in the wings
- At least one life saved



# AD Coroner reports Victoria 2000-12

- Further research requested to inform Court about
  - Frequency of AD as cause of death
  - Any opportunities for intervention prior to death
- 508 AAD deaths
  - 39 deaths annually
  - Range 21 in 2000 to 51 in 2007
- 50 (9.8%) presented to a health service in one month prior to death, approximately 4 deaths/yr
- Clearly an opportunity for prevention, as identified by inquest process



# Thank you

