Hypertension, and The Case for Universal AEDs

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AED Initiative in NZ

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Automated External Defibrillation AED

AEDs

4 Factors have evolved:

- Cost has come down (~$3000; $200 for gel pads every 2 years)
- Increasing awareness that untrained responders can deploy AEDs
- Endorsement of lay responders by AHA
- Increasing awareness of the public

Sudden cardiac arrest
The Facts

- Cardiac arrest occurs in 1500 people each year in NZ
- And 90% die: ~3x greater than the road toll
- For every one minute delay mortality increases 10%
- Median call to location interval for St John is 9 minutes
- Median call to defibrillation interval is 11 minutes

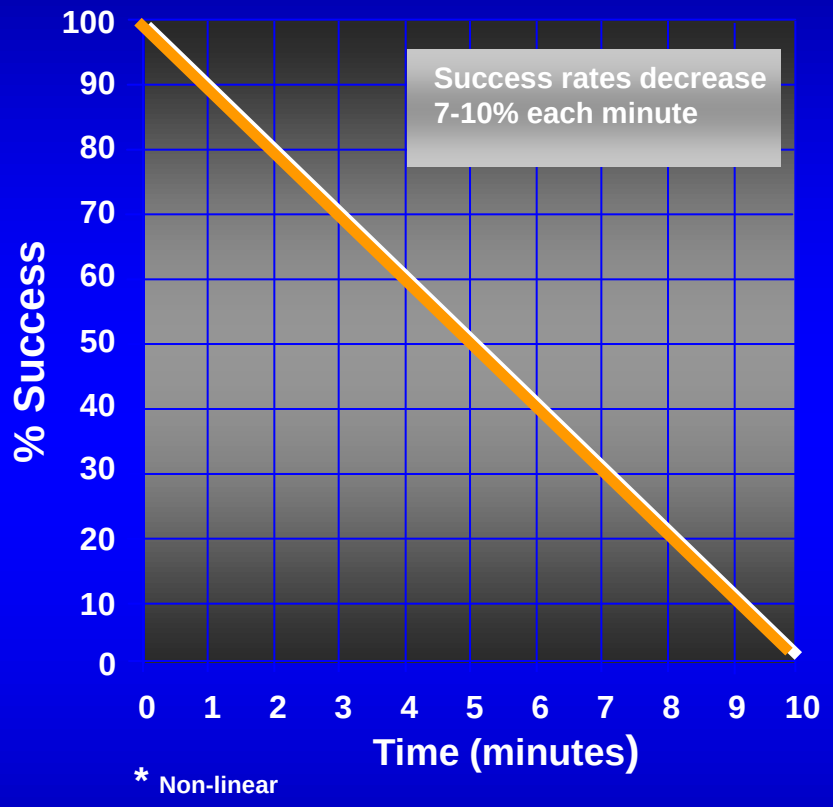
Auckland Cardiac Arrest Database

Sudden cardiac arrest
The Facts

- These intervals are slowly lengthening over time
- The best approach is early defibrillation
- Early CPR is important - Defibrillation will be more successful

Sudden cardiac arrest

- Survival rates plunge 7–10 percent every minute defibrillation is delayed*
- Emergency service can encounter delays
- Quick action by the first person on the scene can save a life



Adapted from text: Cummins RO, 1998. *Annals of Emergency Medicine* 18: 1269-1275.

The Airport experience

- Public Access Defibrillators (PAD) were deployed throughout Chicago's 3 main airports: O'Hare(59), Midway(10) & Megis Field(1)
- They were placed a brisk 60 to 90 second walk apart throughout passenger terminals & housed in glass cabinets
- Over the study 2 year period 21 people suffered a cardiac arrest & 18 presented in an initial VF rhythm
- 11 of the 18 individuals survived (61%)
- The overall survival rate in the US is estimated to be less than 5% & in Chicago 1.8%

Caffrey, S., et al., NEJM. (2002); 347(16): 1242-1247.

The Airport experience

- The rescuers of 6 of the successful resuscitations had no training in AED use
- 19 of the 21 people operating the AED were good Samaritans acting voluntarily
- Between 2000-2006 36 lives were saved at Chicago Airports

Caffrey, S., et al., NEJM. (2002); 347(16): 1242-1247.

Other airports – Number of AED's

- **Atlanta** **300**
- **Honolulu** **60**
- **Heathrow** **96**
- **San Diego** **19**

Queenstown	**1**	**Invercargill**	**1**
Te Anau	**1**	**Napier**	**1**
Palmerston North	**1**	**Dunedin**	**1**
Christchurch	**4**	**Tauranga**	**1**

- **Auckland 0 No Public Access AED's, Fire Rescue have an AED**

- Federal Aviation Authority ruled in 2001 all aircraft with more than 30 passengers & one flight attendant must carry an AED

AED Program: Aims

- Increase public awareness
- Co-ordinate various services and organizations
- Have more AEDs
- Develop a National grid with link to emergency services
- Lay public to recognise their responsibility to be involved

AEDs

Approaches that I am employing:

1. To raise public awareness: initially through The Listener and newspapers, writing to stadiums, casinos, airports, railway stations, police , fire, surf life saving, supermarkets, malls, golf clubs, movie complexes, gyms, rotary, freemasons etc
2. I have formed a Trust ('start a heart') which could co-ordinate a public campaign, raise funds, donations, and advertisements in newspapers and on television
3. To develop a National Grid of where AEDs are. This is supported by the Cardiac Society of Australia and New Zealand and NZMA
4. To connect this grid to the emergency services

AEDs

Approaches that I am employing:

5. To develop a National Standard of signage of where AEDs are situated
6. To ensure maintenance and standard of equipment.
7. To communicate with the many organisations and individuals who have a stake in this
8. Recognition that CPR is important (should be taught in schools, post MI, PCI, CABG etc)
9. Hands-only CPR is likely to increase lay responders
10. Need for high quality data collection and audit

The Parliamentary sub committee chaired by Dr Paul Hutchison (2011)

‘the Health ministry supports the introduction of AEDs in locations that a lot of people visit, such as Airports, transport terminals, and casinos, including those that a lot of high-risk people visit, such as large health centres’

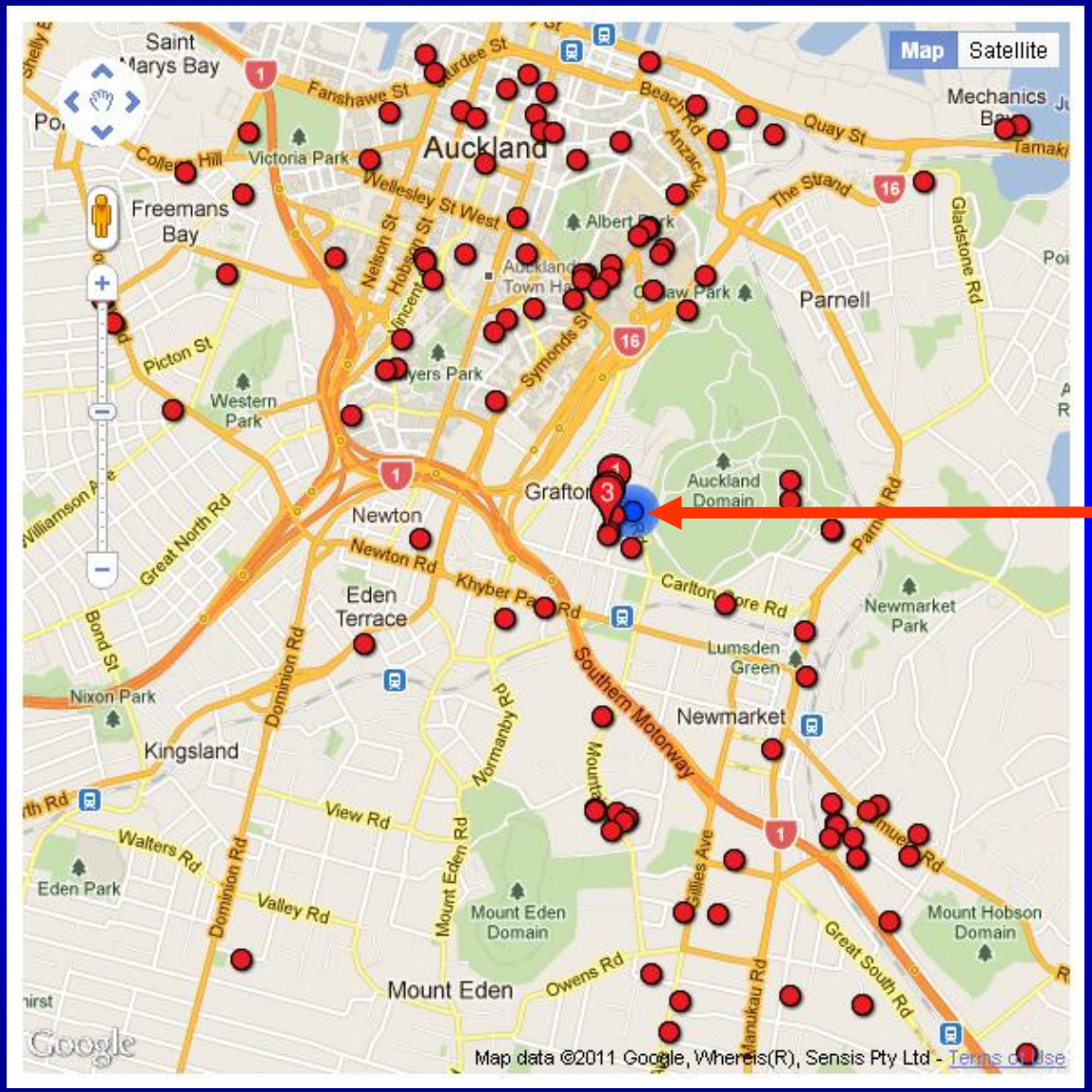
And

‘the Health Committee recommended to the Government that it works towards installing AEDs in community areas that fit the Ministry of Health’s criteria’

AEDs

- App is available on I phones

http://www.aedlocations.co.nz



Auckland City Hospital

Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, NZ

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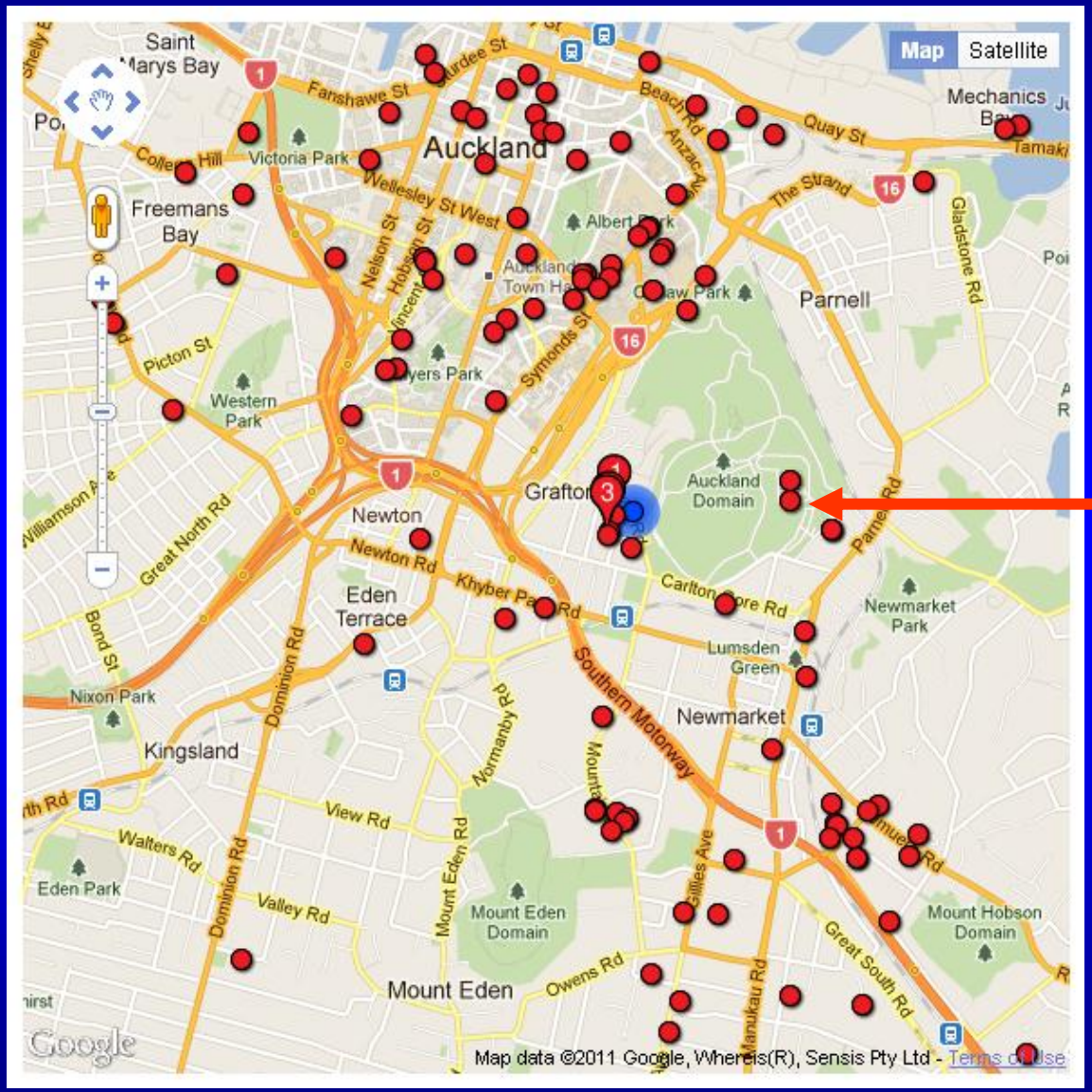
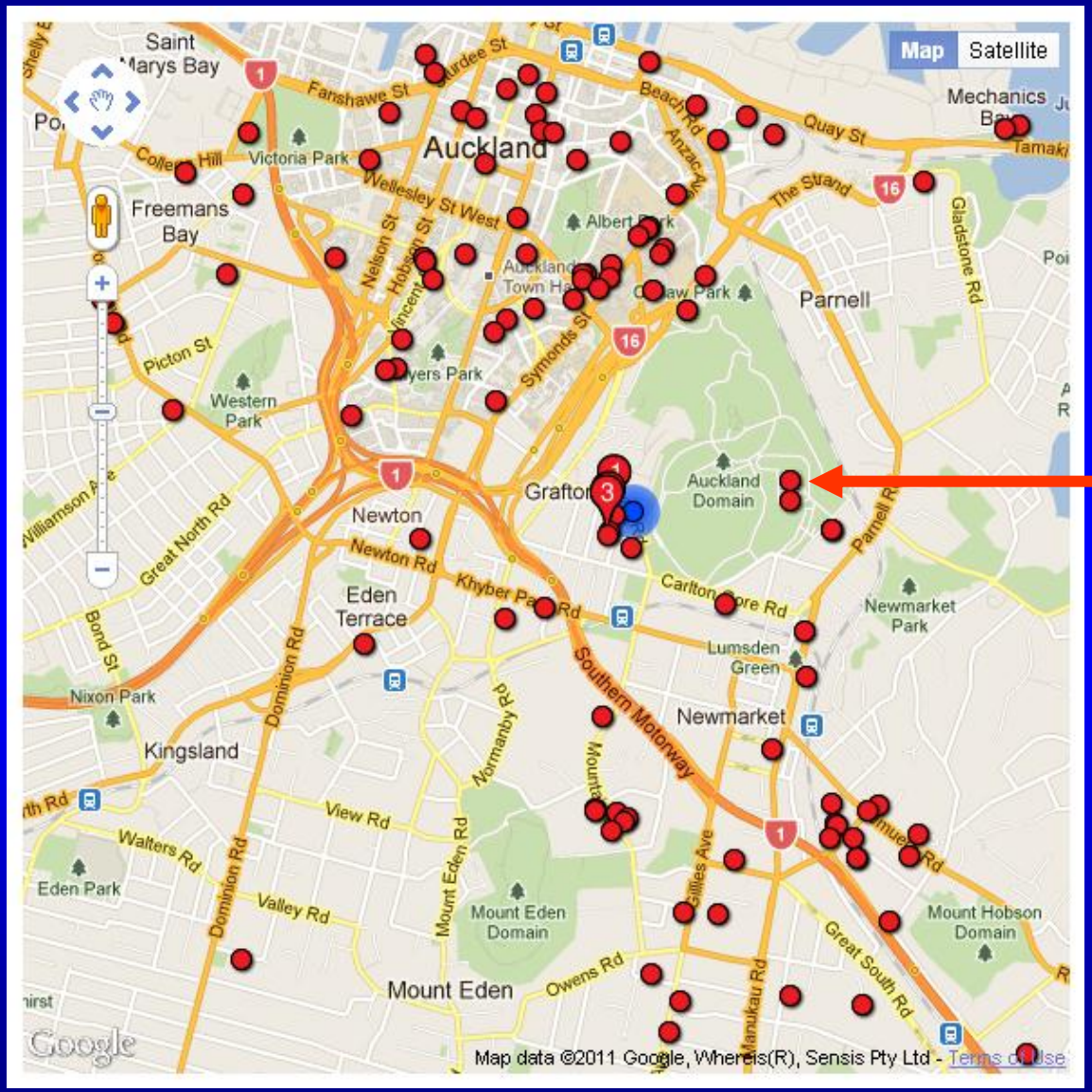


War Museum Atrium

Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, NZ

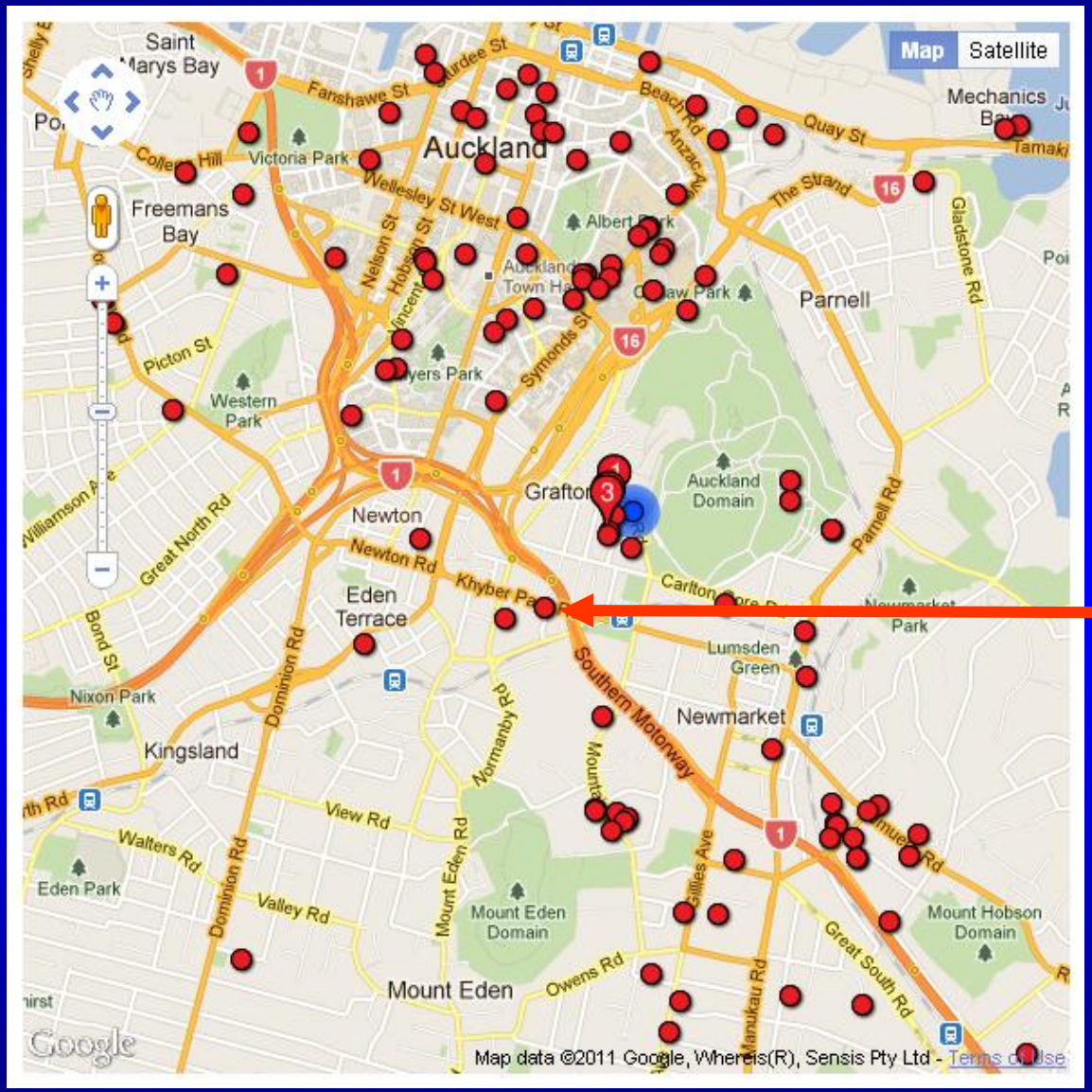
http://www.aedlocations.co.nz



War Museum
Main Entrance

Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, NZ

http://www.aedlocations.co.nz



NZ Red Cross
Khyber Pass

Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, NZ

AEDs

- Early defibrillation increases survival greatly, especially if first shock is delivered within 3 minutes
- They are easy and safe to use
- The operator just follows the AED commands. The decision to shock is made by the AED software, not the operator

AEDs

There should be 10,000 AEDs in New Zealand

Harvey White 2010

AEDs

AEDs should be available in all Government buildings, transport centres (airports, ferry buildings, railway stations), planes, trains and ferries, sports grounds, including “Party Central”, golf courses, casinos, highway patrols and city traffic cars, gyms, churches, shopping malls, movie complexes, banks, service stations and hotels. They should be in every major building, general practices, specialist rooms, Dental Surgeries etc

Harvey White 2010

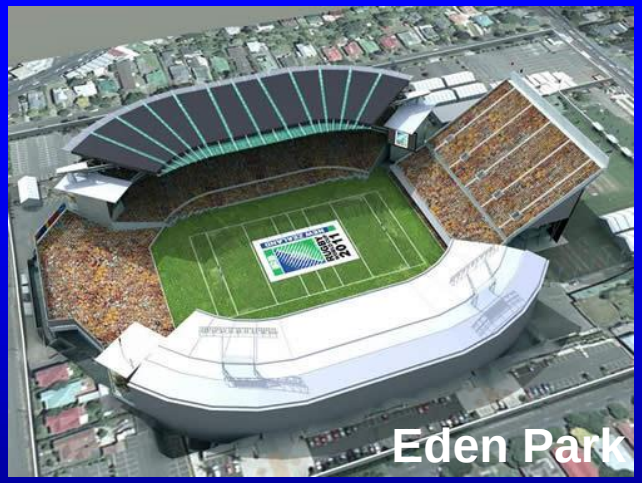
AEDs

- In New Zealand the College of GPs only recommends them for rural GP's

AEDs: where are they in New Zealand

- Oh I think the ASB banks have them don't they?
- **I'm sure my GP would have one wouldn't they?**
- **Isn't there one in this conference centre?**

Which Landmarks have an AED

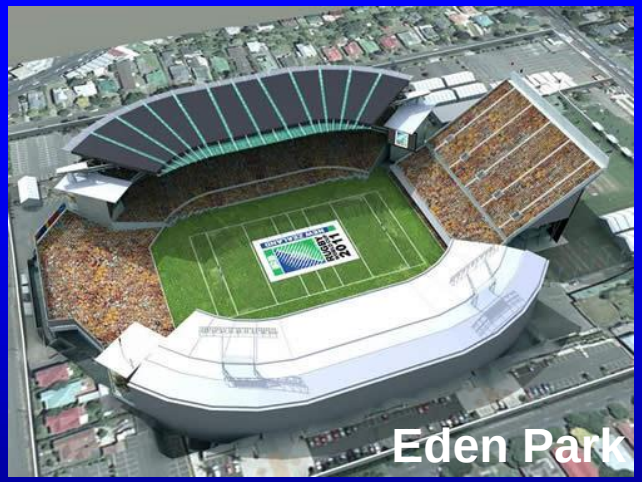


This Landmark has an AED

This Landmark has an AED

These don't


Ferry Building


Eden Park


Auckland
Airport
www.auckland-airport.co.nz
City of Sails

AEDs: implications

- If there is widespread implementation of AEDs resulted in a doubling of survival (as seen in trials)
- Then potentially 150 lives could be saved each year in New Zealand

Cardiac arrest is a treatable condition

Early AED defibrillation before emergency service arrival doubles a victim's chance of survival

Heart of the matter

The report of a life saved with an AED (automated external defibrillator) 10 days after it was bought highlights the potential for making a big difference in saving lives of New Zealanders who have sudden cardiac arrest.

Every year, there are 1500 cardiac arrests that could be treated with AEDs. There are about 1100 AEDs but there should be 10,000.

There are no AEDs at Auckland Airport, SkyCity Casino, the Ferry Building or Eden Park. They should be anywhere where lots of people visit or where high-risk people gather.

Hearts that are too good to die are dying for want of a simple device.

Professor Harvey White, cardiologist, Auckland.


LIFEPAK CR
Professor Harvey White with his portable defibrillator.

Background

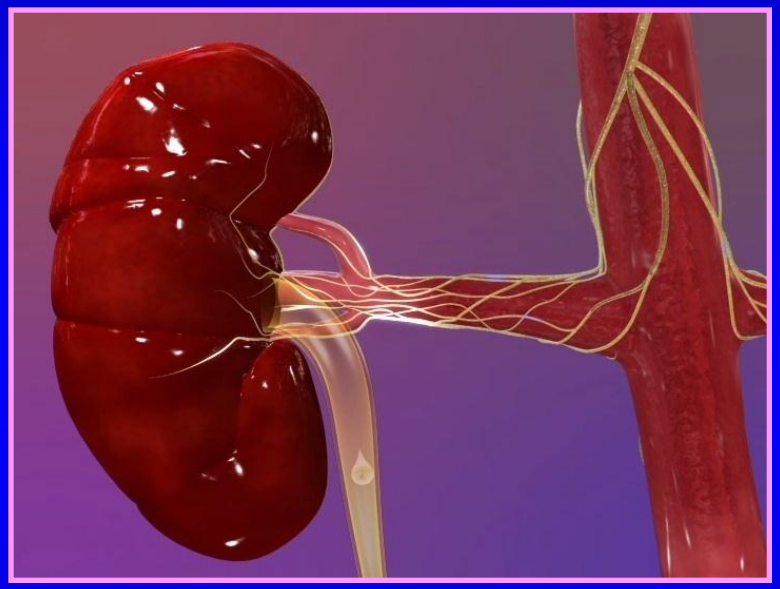
Hypertension is a global public health problem of major magnitude

Despite the availability of safe and effective pharmacological therapies, only ~50% of patients achieve adequate blood pressure control to guideline targets

The sympathetic nervous system, in particular renal sympathetic efferent and afferent nerves, is recognized as critical in the hypertension disease process

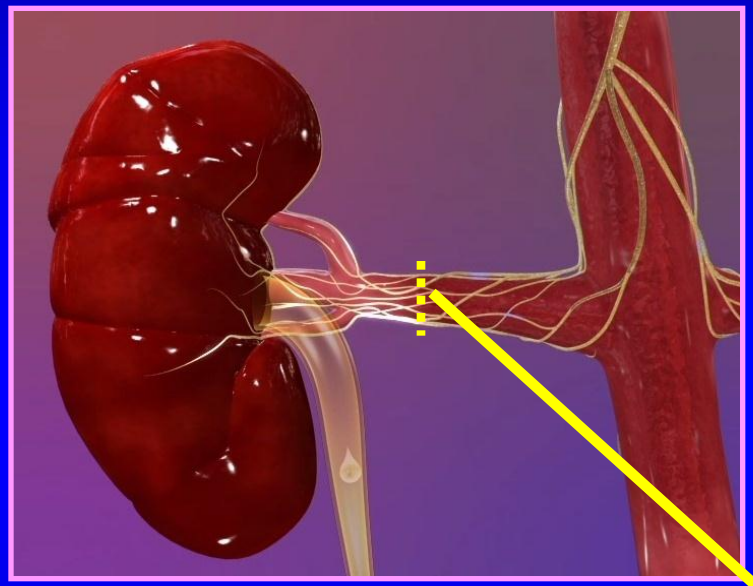
Disruption of renal sympathetic nerves has long been considered an attractive therapeutic target for this condition

Anatomical location of renal sympathetic nerves



- Arise from T10-L1
- Follow the renal artery to the kidney
- Primarily lie within the adventitia

Anatomical location of renal sympathetic nerves



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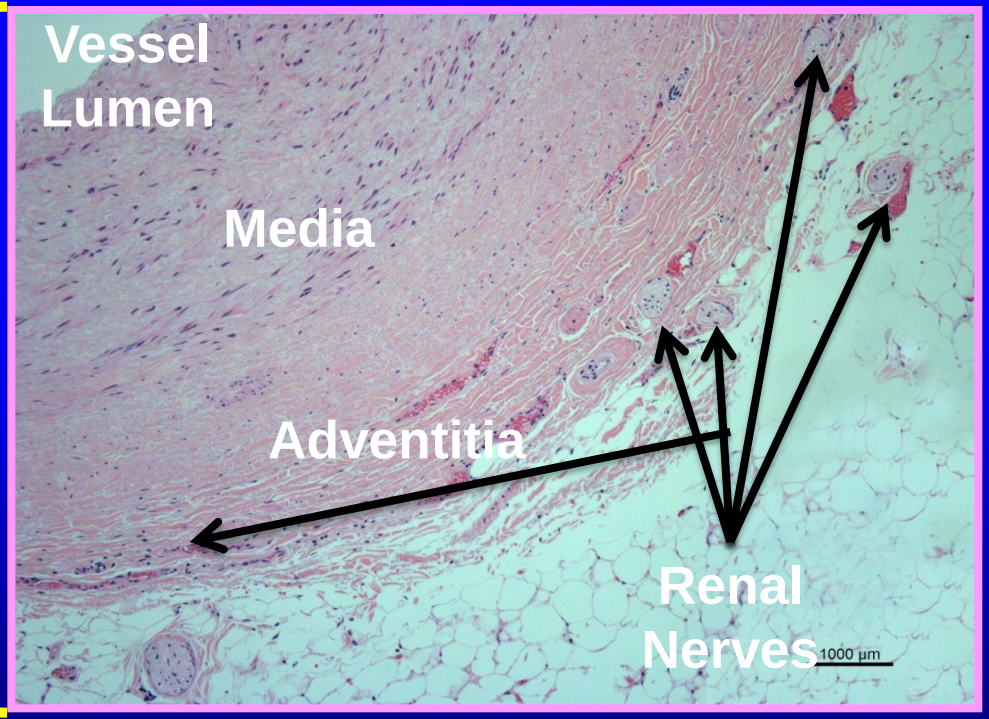
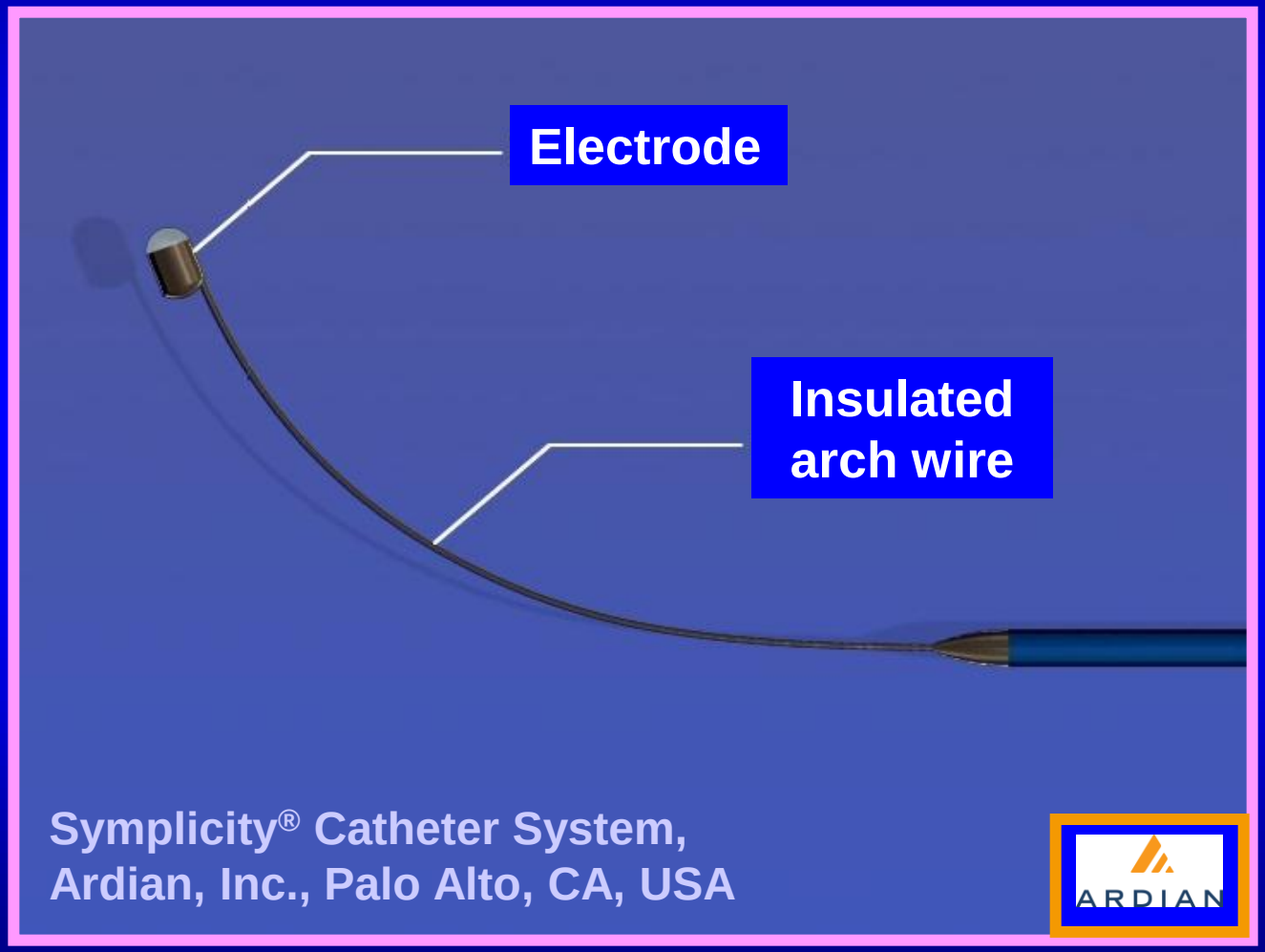
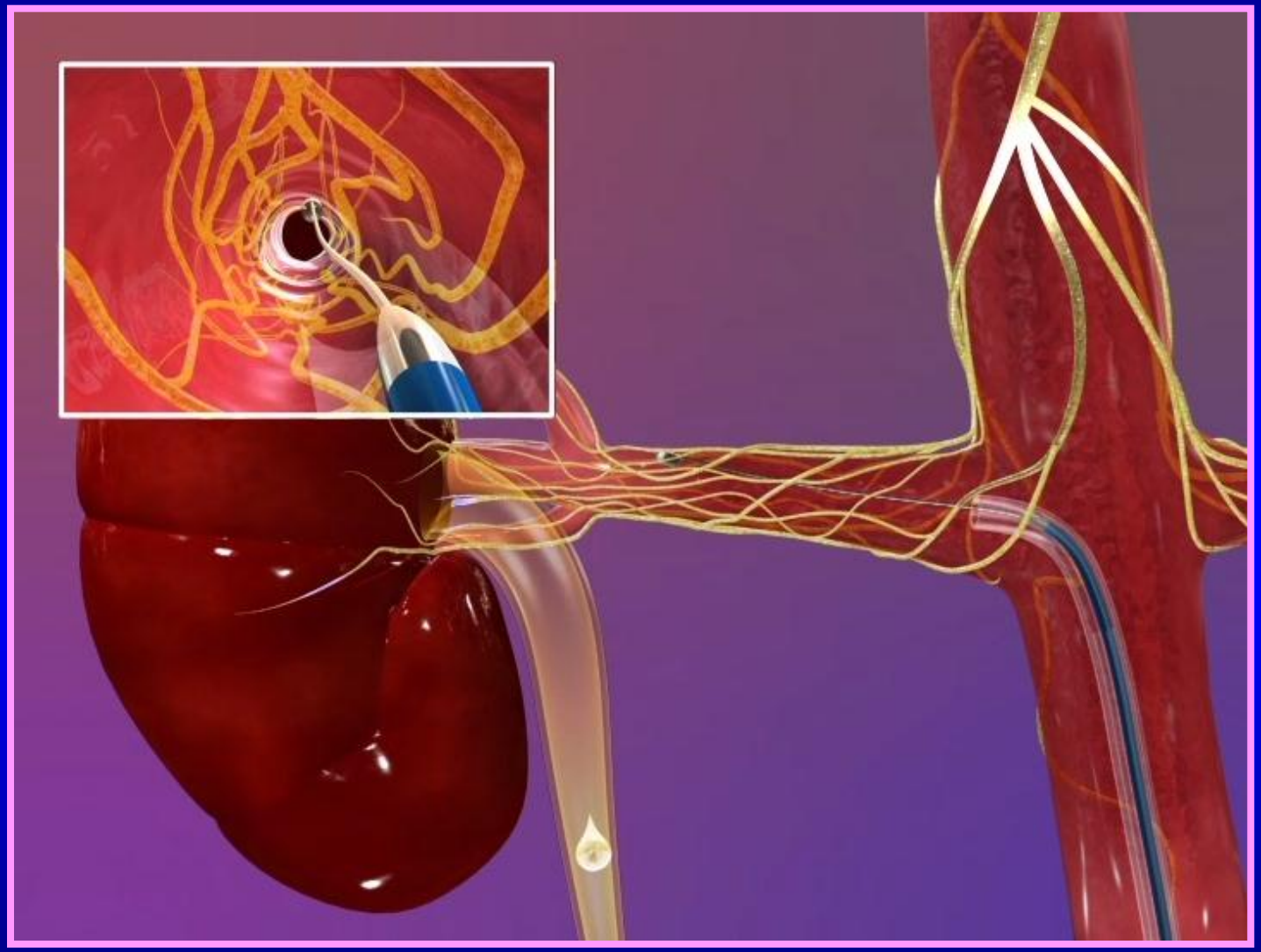


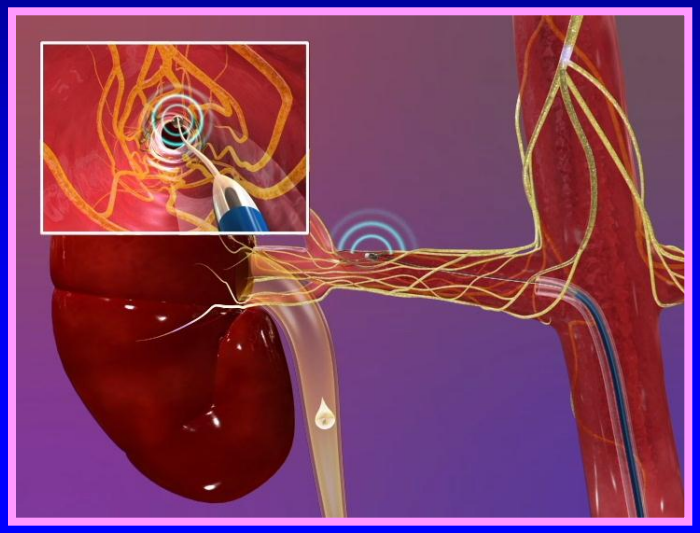
RF ablation approach to renal sympathetic denervation



Placement of renal RF catheter



Treatment by renal RF catheter



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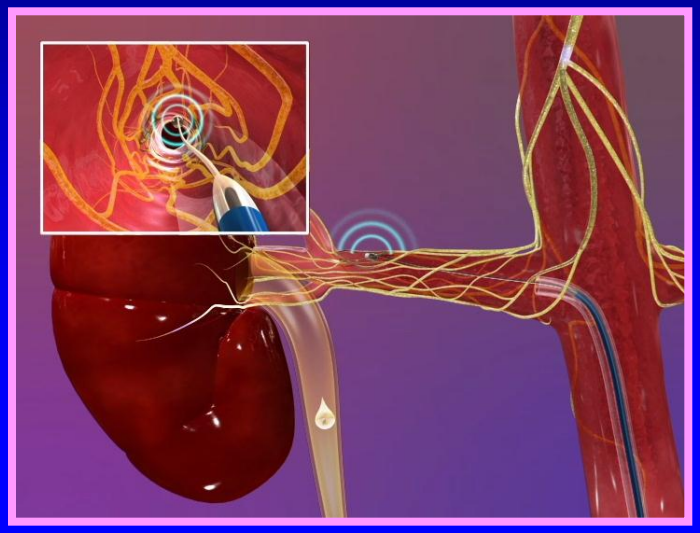

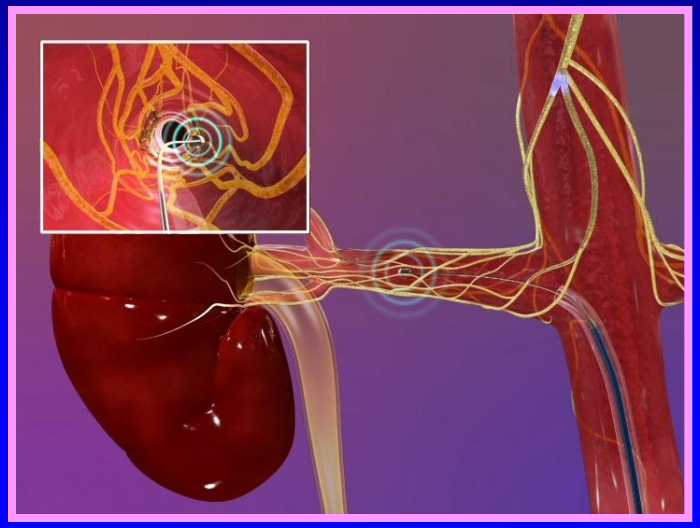

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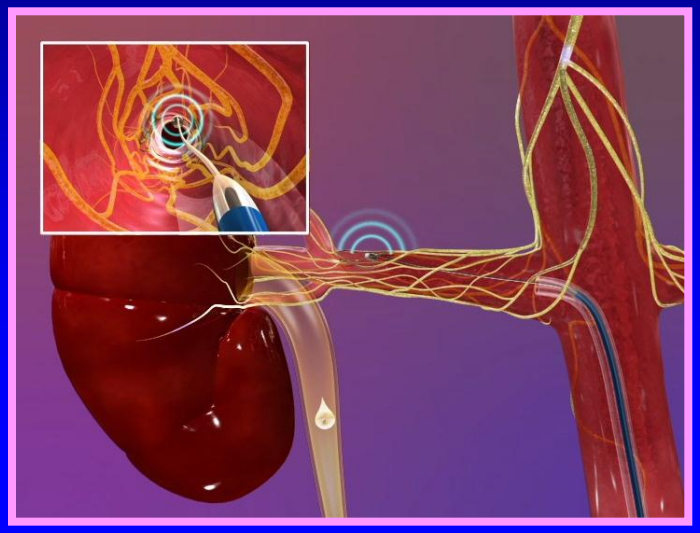

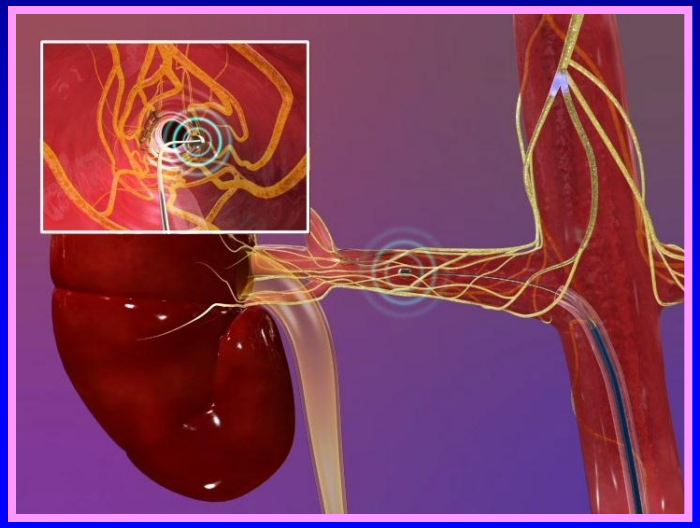

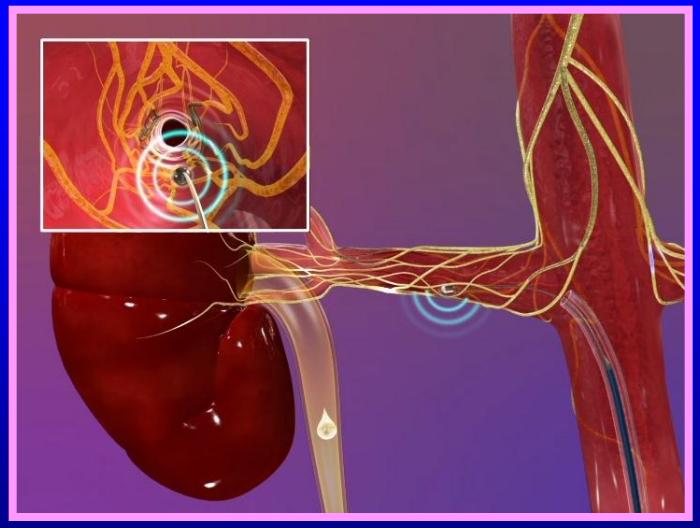

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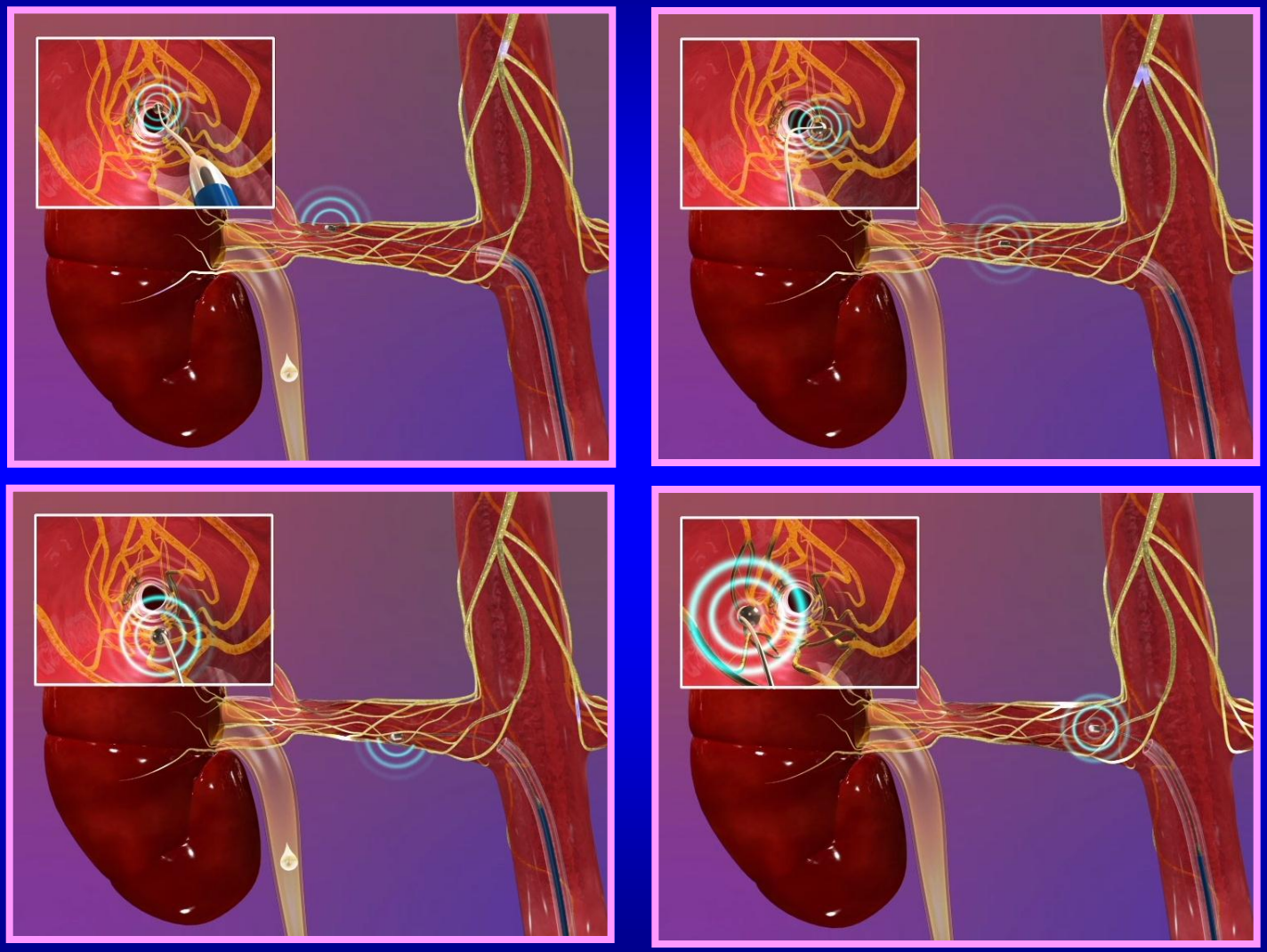
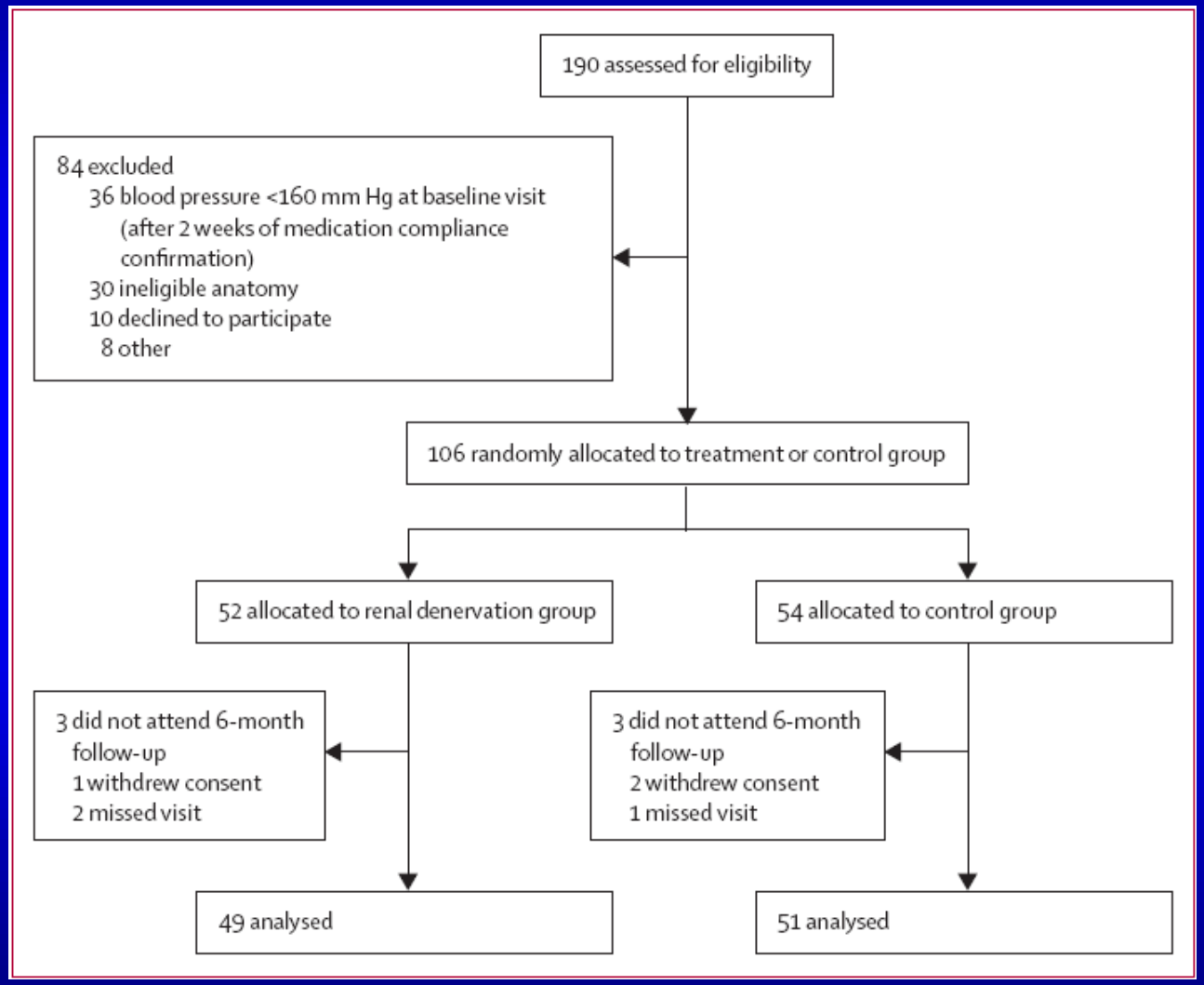


Renal sympathetic denervation

Symplicity HTN-2

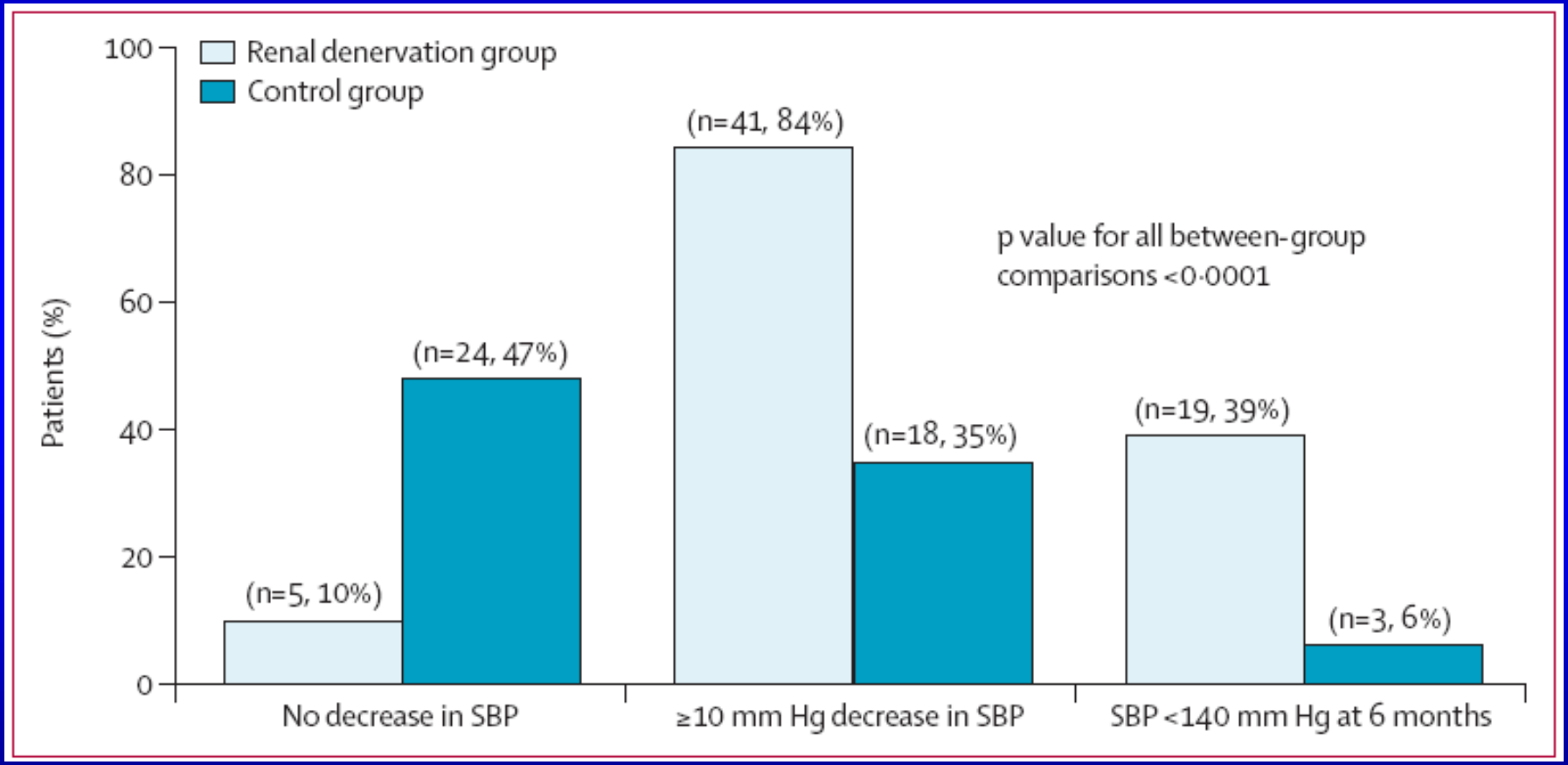


Green Lane Cardiovascular Service, Auckland City Hospital, Auckland, NZ

Symplicity HTN-2 Investigators. Lancet. 2010; 376(9756):1903

Renal sympathetic denervation

Proportion of patients with no decrease in blood pressure

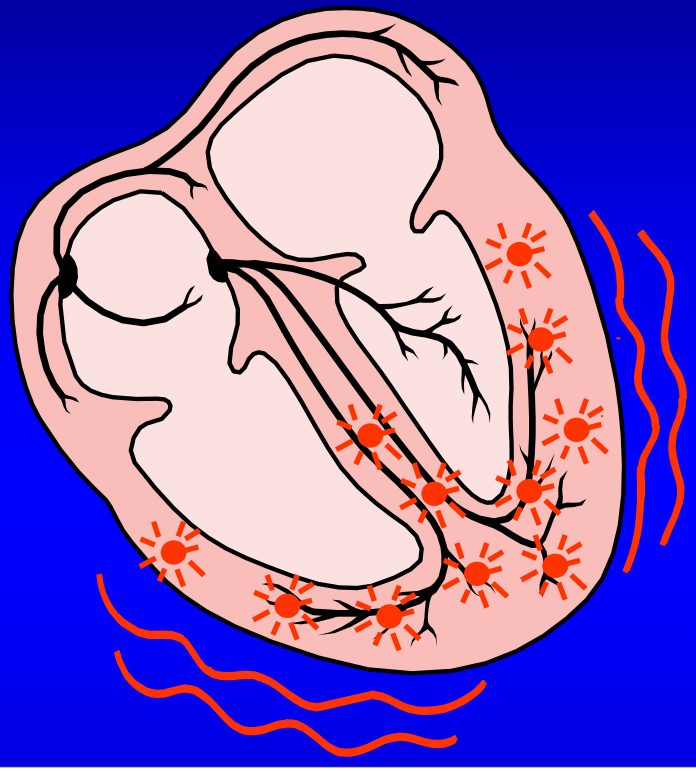


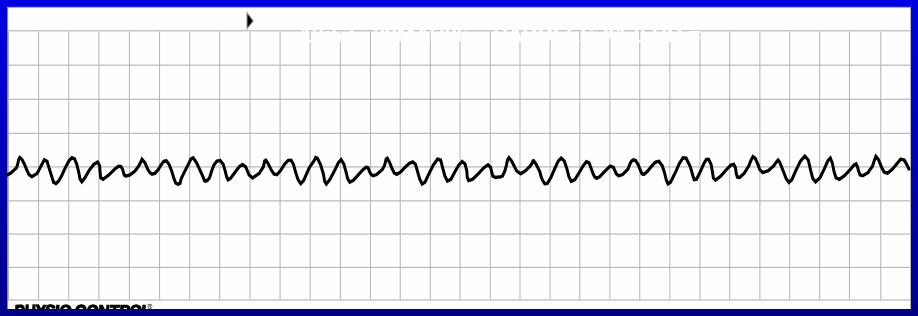
Symplicity HTN-2 Investigators. Lancet. 2010; 376(9756):1903

Catheter-Based Renal Sympathetic Denervation in the Management of Resistant Hypertension

- *20 companies are developing systems*
- *3% (some studies 30%) are truly resistant*
- *5000 patients have been treated but only 250 as part of clinical trials*
- *In majority wont be a cure as patients will need to continue therapy but more will be controlled*
- *? Future role in metabolic syndrome, polycystic ovary syndrome, obstructive sleep apnoea, heart failure, AF*

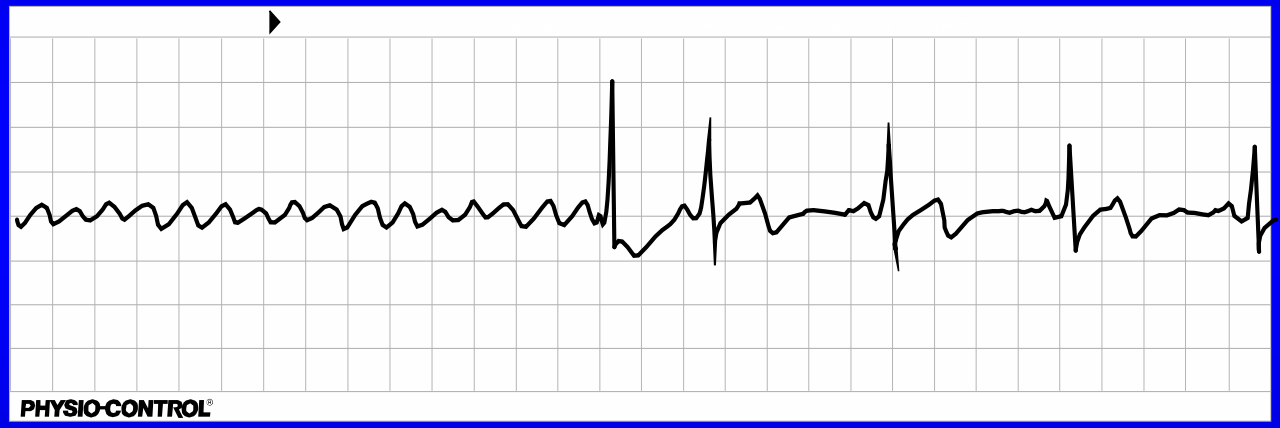
Ventricular fibrillation





Defibrillation

The only effective treatment for ventricular fibrillation



Cardiac arrest in Wellington

- Time to first shock from receipt of 111 call was 12.2 minutes. This increased in 2007-2008 from 10.5 minutes in 2005-2006
- Survival rate to hospital discharge was 12%
- Bystander CPR was administered in 51% of cases

Robinson, S. et al., Resuscitation. 2010; 81: 1648-1651.

Why does it take 12 minutes for the ambulance staff to deliver a shock

- Bystander recognizes cardiac arrest 1 min
- Bystander calls 111 & gets put through to the ambulance service 30 secs
- Ambulance control takes details 30 secs
- Ambulance staff paged and start engine 1 min
- Ambulance drives to scene 7 mins
- Ambulance locates, the crew collect equipment 2 mins walk to scene, set up defibrillator, perform CPR & deliver first shock
- **Total time to first shock 12 mins**

The AED National Grid Working Committee

Harvey White → Consultant Cardiologist → Gareth Jenkin → Resuscitation Co-ordinator → Tony Smith → Intensivist


AED
DEFIBRILLATOR LOCATED:
www.aedlocations.co.nz

Use of AED's by trained volunteers is safe and effective

The American airlines experience

- Qantas was one of the first airlines to put AED's on all international 747 & 767 aircraft in 1991
- At present JetStar domestic aircraft & Pacific Blue in NZ do not carry AED's but Air New Zealand planes do

AEDs
Cost effectiveness in Denmark

- $41,000 per quality-adjusted life year using a survival rate of 25% (several studies report 50%) using the European Resuscitation Guidelines covering 1.2% of Copenhagen and19.5% of cardiac arrests
- $33,000 for AHA Guidelines covering 16.8% of cardiac arrests

Folke F., et al., Circulation. 2009; 120: 510-517.

AED Guidelines

European Resuscitation Council

- AED placement in areas with 1 cardiac arrest every 2 years

Handley AJ., et al., Resus. 2005; 67: 87.

AHA Guidelines

- AED placement in areas with 1 cardiac arrest every 5 years

Aufderheide T., et al., Circulation. 2006; 113: 1260-1270.

AEDs funding

Not from Health budget

AEDs funding

From Community funding

AEDs: where should they be placed

- Appropriate locations include sites that cannot provide Emergency Service (EMS) response within 5 minutes
- Where emergency response times are long AEDs will have a far bigger effect

What's the AHA position on placement of AEDs

- The AHA strongly advocates that all EMS first-response vehicles and ambulances be equipped with an AED or another defibrillation device (semiautomatic or manual defibrillator)

- The AHA also supports placing AEDs in targeted public areas such as sports arenas, gated communities, office complexes, doctor's offices, shopping malls, etc

Sudden Cardiac Arrest

- Sudden cardiac death is a major health issue in New Zealand
- Survival is low (~4-12%)
- The most important factor that determines survival and good neurological outcome is the time before starting life saving measures

The Naïve 11 year olds' experience

- 15 children from a school in Washington State were selected for the study
- A clothed mannequin was placed in an adjacent room
- The students were told the mannequin represented a cardiac arrest patient
- These students had no training in the use of an AED. All they were told was they would be required to peel the pads off the packaging and apply then to the chest

Gundry, J., et al., Circulation. 1999; 100: 1703-1707

The Naïve 11 year olds' experience

- Mean time to delivery of the first shock was 90 seconds (range 69 to 111 seconds)
- The study was repeated with paramedics. Mean time to deliver shock was 67 seconds (range 50 to 87 seconds)
- All participants remained clear when the 'patient' was shocked

Gundry, J., et al., Circulation. 1999; 100: 1703-1707

The chance of any one AED being used is small, but if it is used the chance of success is higher

AEDs

- Even 11 year olds with no training can use them successfully
- Need to be highly visible, well sign posted
- If they are kept locked behind a door and never seen they are less likely to be used