

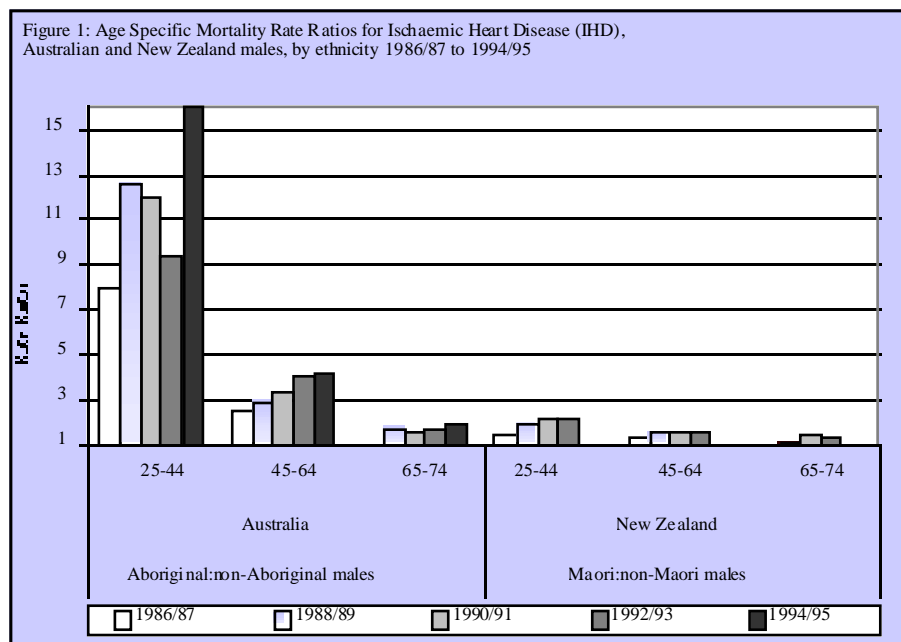
The Context of Indigenous Cardiovascular Disease

Briefing Paper for the CSANZ/NHF Workshop: 'Reducing Time to Care in Patients with AMI'
by Dr Alex Brown, Senior Research Fellow, Menzies School of Health Research & the Australian Indigenous Doctor's Association

■ Background

Cardiovascular Diseases (CVD) are the major causes of death of adults in most developed countries throughout the world ¹. In the Australian setting, cardiovascular diseases were the primary cause of adult deaths in 2000 ², and are a significant contributor to the overall burden of disease experienced in Australia ³. Similarly, CVD is the biggest cause of deaths and of excess deaths for the Aboriginal and Torres Strait Islander population ^{4,5}. Age-adjusted CVD death rates in Aboriginal and Torres Strait Islander people are approximately three times as high as in the non-Indigenous population. Perhaps more importantly, age specific mortality differentials are much greater between the ages of 25-54, where Indigenous death rates are between seven and twelve times that of non-Indigenous populations ⁶. Coronary heart disease (CHD) is the leading contributor to all CVD deaths among Aboriginal and non-Aboriginal populations in Australia ⁷. Similarly, it is the leading single contributor to premature deaths, accounting for 20% of all potential years of life lost before the age of 75 years among Aboriginal and non-Aboriginal males. Despite the same relative contribution to premature mortality, it accounts for four times as many years of life lost among Aboriginal males than among non-Aboriginal males ⁷. The impact of these premature and preventable deaths on the fabric of Indigenous families, communities and society cannot be overstated.

The last thirty-five years have witnessed dramatic declines in age-standardised mortality from cardiovascular diseases across most developed countries, including Australia, New Zealand and the United States ^{8,9}. These improvements, however, have not been witnessed equally among all population groups, leading to a greater relative disadvantage among Indigenous Australians over time ⁷.



Source: Brown 1999 (Australian data from NT, WA and SA only).

As can be seen in Figure 1, the greatest relative disadvantage for Ischaemic Heart Disease (IHD) is experienced by Indigenous Australians at younger ages. Furthermore, this relative disadvantage is growing rather than contracting. Between 1986/87 and 1994/95, mortality rates among Aboriginal males aged 25-44 years grew from 8 times to 16 times that of non-Aboriginal males. For Indigenous males aged between 45 and 64 years the rates of death from IHD rose from 2.4 times that of non-Indigenous males in 1986/87, to just over 4 times in 1994/95. Even among Indigenous males between 65 and 74 years of age, who demonstrated lower relative disadvantage when compared to their non-Indigenous counterparts, the differentials still grew from almost zero in 1986/87 to just under two in 1994/95. These relative disadvantages are markedly greater than those witnessed between Maori and non-Maori males of all age groups in New Zealand over the same time period.

The contribution of differential treatment, pre-hospital mortality, baseline general health status, rates of sudden cardiac death and geographical, behavioural and cultural barriers to necessary care for clients suffering from acute myocardial infarction based on their ethnicity has yet to be explored in any great detail in the Australian setting.

■ Explaining Cardiovascular Differentials

Among various Indigenous groups around the world, transition between traditional and contemporary lifestyles has been noted as an important and likely antecedent to the adoption of westernised lifestyles, an increase in the prevalence of conventional risk factors for CVD, and the subsequent high rates of CVD, renal impairment and impaired glucose tolerance and diabetes^{10,11,12}. As such, current documented risk factor levels among Indigenous groups may account for some of these differences in CVD burdens.

Despite the lack of representative national data, type 2 diabetes has been noted to be far more common in Indigenous Australians than among their non-Indigenous counterparts¹³. Smoking rates remain higher than those demonstrated in the non-Indigenous population of Australia, as is obesity¹⁴, physical inactivity¹³, hypertension and hypertriglyceridaemia^{12,15,16}. In addition to these 'conventional' risk factors for CVD, there is considerable interest in a growing list of 'novel' risk factors such as elevated levels of homocysteine and markers of inflammation such as C-reactive protein, both of which have been shown to be at high levels in a remote Aboriginal community in Western Australia¹⁵. The contribution of these factors to the disproportionate burden of CVD in Indigenous Australians is yet to be clearly demonstrated.

Numerous studies have also confirmed that 'psychosocial stress' induced by social isolation, poverty, hopelessness and lack of empowerment and control over life chances has important associations with coronary disease^{17,18,19,20}. The National Heart Foundation, in a review of various systematic reviews of coronary heart disease and psychosocial stressors which was incorporated into a recently released position statement²¹, found that there was "strong and consistent evidence of an independent causal association between depression, social isolation, and lack of quality social support and the causes and prognosis of CHD"; and furthermore, "the increased risk contributed by these psychosocial factors is of similar order to the more conventional CHD risk factors such as smoking, dyslipidaemia and hypertension".

Understanding the impact and interactions of various psychosocial and cultural factors on the burden of CHD in Aboriginal Australians is an area of enormous need. The fundamental determinants of poor health among Indigenous Australians include poor housing, income inequality, overt poverty, low levels of education, poor sanitation and environmental conditions, high levels of perceived stress and social dysfunction. Further, the loss of land, culture, language and identity, perpetuation of covert and overt racism, the impact of premature death, perpetual grieving, pain and loss, and the lack of opportunity afforded many individuals, have long been highlighted by Indigenous individuals and organisations as fundamental causes of ill health. Through what bio-psycho-social pathways these factors directly incur risk of coronary disease remains to be fully outlined. To what extent these factors account for the excess burden of CVD among Indigenous population groups remains to be qualified or quantified. Furthermore, what role do these factors play in an individual's behaviour in seeking assistance at a time of acute illness, their acceptance of evidence based care, preventative health care, or long term follow-up and treatment?

Despite the clear evidence of greater absolute risk among Indigenous Australians, the increased prevalence of conventional risk factors for CVD in the Indigenous population is unlikely to fully explain the high CVD incidence and mortality. Given that social factors influence the risk of CHD, the excess CVD mortality in Indigenous populations is most likely to be multi-factorial in origin, and have its foundations in the economic, social, physiological, psychological and educational disadvantage of the Aboriginal population. These are critical points that must be understood and incorporated into the development of systematic approaches that serve not only to reduce the time to care for Aboriginal clients with acute myocardial infarction, but more broadly, to improved care for those with or at elevated risk of all cardiovascular diseases.

■ The Contribution of Barriers to Necessary Care

There are clearly many barriers to the appropriate care of Indigenous clients with established cardiovascular disease. There are clear indicators that Indigenous populations in Australia utilise health care services differently from the remainder of the population²². The pattern of utilisation is dominated by publicly provided services, with under-utilisation of Commonwealth monies for Pharmaceutical Benefits, Medicare, specialist services and general practitioner consultations²³. These differences may explain the lower access to and receipt of appropriate preventative care for those with, or those at risk of, cardiovascular diseases.

Unfortunately, data exploring the differences in access and availability of appropriate cardiovascular therapies for Indigenous Australians is limited. Access to specialist cardiology services, appropriate interventional diagnostics and acute care modalities is limited in remote and regional areas where large Indigenous groups reside²⁴. Furthermore, there is evidence to suggest that even when health care facilities are available, Aboriginal people are less likely to receive cardiac procedures than non-Indigenous people during hospital admission²⁵. Examination of the National Hospital morbidity database for separations occurring between July 1997 and June 1998, found that Aboriginal patients with hospital admissions for acute CVD were significantly less likely to undergo major procedures, such as angiography, or undergo coronary artery bypass surgery or coronary angioplasty compared to the non-Indigenous population. As such, there may be systematic differences in the treatment of CVD between Indigenous and non-Indigenous populations within the health care sector. This would not only seem in direct conflict with relative need, but also highlights an unacceptable process of care for Indigenous Australians.

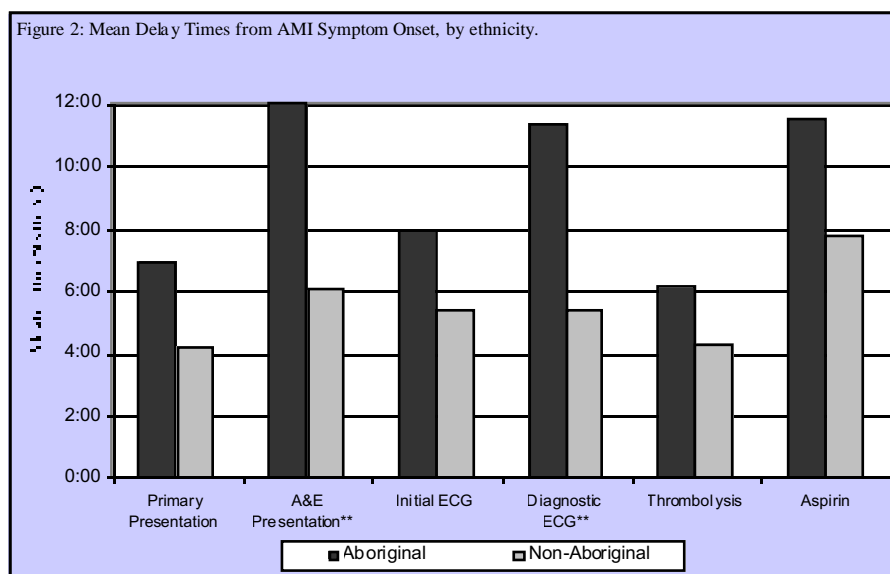
The most comprehensive account of access to acute care for Aboriginal clients suffering from CHD was provided by Ong and Weeramanthri²⁶ in a review of 122 separate acute myocardial infarctions (AMIs) in the Top End of the Northern Territory. Of the cases reviewed, 41 were among Aboriginal clients. In total, 15 of the 41 AMIs diagnosed among Aboriginal clients occurred before the age of 40, with only one occurring in a non-Aboriginal client under the age of 40 years. The mean age of Aboriginal clients was 45.6 years, 13.3 years younger than among non-Aboriginal clients.

In terms of background CVD risk factors, Aboriginal clients were more likely than non-Aboriginal clients to be either current or ex-smokers (88% versus 69%, OR 3.2, $p=0.01$), and more likely to have chronic renal disease (27% versus 2%, OR 14, $p<0.0001$). However, there was no difference between ethnic groups in documented knowledge of hypertension, obesity, diabetes or family history of IHD. Similarly there was little difference between Aboriginal and non-Aboriginal clients in terms of previously diagnosed IHD, previous number of AMIs or previous admissions to hospital for IHD.

Whether the apparent lack of difference in background risk among cases is due to the direct comparison of a younger Aboriginal group to an older non-Aboriginal group (given that CVD risk factors tend to increase with age), recall bias, failure of appropriate screening at the primary health care level for Aboriginal clients (i.e., undetected risk), or a true representation of comparative risk is not clear from the available data.

Interestingly, non-Aboriginal clients were more likely to present with symptoms that could be considered typical (OR 2.6, $p=0.02$). Almost half of all Aboriginal clients presented with either atypical symptomatology or no symptoms at all. The development of appropriate processes for improving time to care for those suffering AMI should consider the potential differences that exist in the nature of symptoms described by Indigenous clients presenting to acute care facilities, patient symptom recognition, the possible role of silent infarction, and the differences that may exist in health service symptom recognition and subsequent diagnostic, treatment, and investigative decision making, guidelines and care plans.

Ong and Weeramanthri also explored the delays inherent in presentation, diagnosis and management for both Aboriginal and non-Aboriginal clients. Among the findings was the demonstration that Aboriginal people experienced clear delays in presenting to acute care facilities when suffering an AMI.



Source: Ong and Weeramanthri (2000).

As can be seen in Figure 2, Aboriginal clients demonstrated greater delays than non-Aboriginal clients in primary presentation (time from symptom onset to first presentation to any health service), presenting to emergency departments at hospital, in the performance of initial and diagnostic ECGs, and in the receipt of thrombolysis and aspirin. Given the small case numbers these differences were only statistically significant for two categories; time delay to emergency department presentation and time until the performance of an ECG diagnostic for AMI. When stratified by location, Aboriginal clients suffered greater delay times than their non-Aboriginal counterparts for all parameters, whether their AMI occurred in rural or urban settings.

When comparing Aboriginal clients between rural and urban settings, patients with symptom onset in rural environments demonstrated minimally greater delay times in primary presentation (7:04 hrs versus 6:15 hrs), greater delays in time to emergency department presentation (12:58 hrs versus 9:33 hrs), but smaller delays in the performance of first ECG, diagnostic ECG and in receiving aspirin.

Of the Aboriginal cohort reviewed (n=41), only 12 cases received thrombolysis as part of routine care. Among these cases, rural Aboriginal clients demonstrated clear delay times to the receipt of thrombolysis in excess of Aboriginal clients within urban settings (7:09 hrs versus 2:45 hrs), and greater delays than experienced by non-Aboriginal clients receiving thrombolysis in rural settings (6:47hrs) and urban settings (4:03hrs). These additional delays were noted despite the fact that 75% of rural Aboriginal clients received pre-hospital thrombolysis. Unfortunately, no comparative outcome data was collated to determine the potential benefits of pre-hospital thrombolytic therapy for Aboriginal clients.

Of the 29 Aboriginal clients with AMI who did not receive thrombolysis, almost half^{14,29} were considered to have delayed presentation to greater than twelve hours since symptom onset. Other reasons cited for not receiving thrombolysis included the presence of contraindications (n=6), non-diagnostic or slowly appearing ECG changes (n=6), not given despite relevant indications (n=2) and early presentation, but significant medical retrieval delay precluding thrombolysis within the therapeutic window (n=1). As demonstrated by the breakdown of cause for non-thrombolysis, few cases were not thrombolysed when clinically indicated.

Unfortunately, the time of onset of AMI symptoms could not be determined in just over a third of all Aboriginal patients. Retrospective assessment of these individual cases estimated that the delay between onset of symptoms and first presentation to any health service (primary presentation), was probably between 48 hours and one week. As such,

delay times, and the greater relative delays to necessary care for Aboriginal clients suffering from AMI may have been significantly underestimated.

Comparative data on which to compare these findings are difficult to find. Routinely collected quality assurance data has been collated at Alice Springs Hospital (ASH) since at least 1999.

Data from 1999 demonstrates significant delay in the provision of routine medical therapy for Indigenous clients when compared to non-Indigenous clients presenting to the emergency department of ASH (unpublished data). In total, 38 patients were diagnosed with AMI during 1999, including 19 Indigenous clients. Unfortunately, clients receiving thrombolysis (a small percentage) before hospital were excluded from calculations. There were significant delays noted for Indigenous clients in receiving nitrates, aspirin and analgesics when compared to non-Indigenous clients, however, there was no difference in 'door to needle time' for both Indigenous and non-Indigenous groups (1:27hrs versus 1:34hrs). Unfortunately, only 3 of 19 (15.8%) Indigenous clients received thrombolysis, despite the fact that 6 (31.6%) presented within 12 hours of symptom onset.

Data from January 2000 until June 2001 highlighted 62 clients with AMI presenting to ASH, including 27 Indigenous clients. Indigenous clients were less likely than their non-Indigenous counterparts to present within 12 hours of symptom onset (45% versus 65.6%). However, there was little difference in median 'door to needle times' between ethnic groups (53 minutes versus 47 minutes). Unfortunately, only 4 of nine Indigenous clients that presented within 12 hours from symptom onset received thrombolysis. The reasons for not receiving thrombolytic therapy were not collected.

Unfortunately, questions of the ability to generalise these findings to larger Aboriginal populations throughout the country must be considered. Whether or not these delays in the receipt of care exist for Aboriginal populations within larger metropolitan areas, or even in other rural and remote settings is not known. There is a clear need to explore delays for other Aboriginal clients in various settings to ensure the development of locally driven systems that serve to decrease time to necessary care.

Regardless of these reservations, the available evidence highlights important issues that require consideration. Given the evidence of the value of early cardiovascular care for acute cardiac events, delays in the receipt of appropriate care are likely to be contributing to poorer outcomes among Indigenous people. However, geographical isolation alone cannot be the sole explanation for delay times experienced by Aboriginal clients, nor the sole explanation for poorer outcomes and higher mortality from CHD. Systematic

approaches that serve to decrease the time to care for Aboriginal clients with AMI must therefore focus on a range of critical issues including patient delays, exploration of the potential systematic barriers that may exist to access of available services and health care delays within the primary, retrieval, and secondary setting.

Exploring Patient Delays in the Context of Indigenous CVD

As part of Ong and Weeramanthri's review of AMIs in the NT²⁶, a small sample of in-depth qualitative interviews were conducted to assess various barriers to care and patient understandings of AMI symptoms in an attempt to understand the significant delays experienced by Aboriginal clients. In total, 19 clients were interviewed, including 14 Aboriginal clients, and 5 non-Aboriginal clients post-infarction.

Most of the interviewed non-Aboriginal clients stated that they did not realise they were suffering an infarction until told by hospital staff. Furthermore, all were poorly educated about the symptoms of AMI prior to their acute event. Similarly, among interviewed males, the reason for seeking medical assistance was generally at the insistence of their partners. The behavioural aspects of patient delay, particularly among males, require significant clarification if systems are to be developed and behaviour modification enacted to decrease times to care for those with AMI.

Of the Aboriginal clients interviewed, 10 were from rural communities and 4 were from urban settings. Among the urban group, AMI was seen as a consequence of stressful lives, whether as a result of individual stress associated with day to day life, or as a result of continuing worry about family issues, community dysfunction or changing roles and responsibilities within contemporary society.

In addition to the broad framework within which clients understood the causes of AMI, significant barriers were discussed by Aboriginal clients in terms of accessing necessary care. One client discussed the fact that community members preferred not to use currently available health services, regardless of their medical needs, mainly due to the cultural inappropriateness of mainstream services.

In terms of interviewed rural Indigenous clients, a wide spectrum of causation, health awareness and willingness to accept and utilise clinical services were noted. Social and spiritual causes predominated as the perceived cause of heart disease. Spiritual causes of heart disease, particularly AMI, included a number of understandings ranging from the result of high levels

of community stress as a result of behaviour considered inappropriate within various cultural settings, to sorcery.

As seen in urban settings, clients discussed the high levels of community stress, community dysfunction and changing social roles within contemporary society as likely causes of heart disease. Similarly, rural clients often discussed the unease that they felt with utilising available health services, preferring not to go to hospital despite medical need. Rural clients often delayed presentation, because of fear that hospital care was a cause of death among patients, due to past experiences of family or community members who did not return from hospitals. Consistent across a number of clients was also evidence of significant communication barriers between patients and a range of medical providers. As a result, awareness of the causes, symptoms and treatment of AMI among rural clients was often at odds with accepted medical practice.

Despite the limited number of qualitative interviews, Aboriginal and non-Aboriginal clients displayed a diversity of perspectives as to the cause, prognosis, treatment and acute care needs of AMI. This heterogeneity of understanding, between ethnic groups and even within ethnic groups, is critical to the development and implementation of strategies aimed at reducing time to care for clients with, or at risk of acute myocardial infarction. Furthermore, the social constructs of heart disease among Aboriginal clients cannot be ignored in the development of approaches that serve to improve outcomes for Indigenous populations.

Critical Issues in Reducing Time to Necessary Care for Indigenous Clients Suffering AMI

Despite the paucity of available data, what information exists highlights a range of barriers to care for Indigenous populations suffering from acute cardiac disease. Similarly, there exists a range of health beliefs about causation, symptom recognition, treatment, acute care and prevention that have impact on the acceptability and appropriateness of available health care services and as such, on the potential benefit of known evidence based therapies. These issues should be considered in developing appropriate health systems and preventative policy.

In brief there are a range of critical issues facing rural and remote populations, and Indigenous Australians across a range of geographical settings, when suffering AMI.

- **Critical Moments in Acute Coronary Syndromes:** As outlined in the available literature, there exists a range of patient and system driven delays for those suffering acute myocardial infarction. A temporal approach, within the evolution of acute disease,

should serve as a model of defining and acting on potential delays. This should span individual awareness, symptom recognition, early warning signs and family recognition, an individual's interaction with available health services and a range of system driven points of delay, from initial assessment, through retrieval, to secondary and tertiary care.

- ***Pre-Hospital Thrombolysis:***

Unfortunately the evidence available by which to evaluate the potential benefits, costs and risks of pre-hospital thrombolysis within Indigenous populations in rural and remote settings is limited. Nonetheless, the potential benefits as defined within mainstream populations would deem it an approach worth pursuing, as part of a comprehensive approach to the unacceptable burden of CVD among Indigenous Australians. Trials of pre-hospital thrombolysis within this population should focus on issues of effectiveness and outcomes, costs, staff issues of training and diagnostic support, the need for monitoring and defibrillators, the choice of agent, and questions of various models of pre-hospital thrombolysis delivery (stored in clinic versus carried by retrieval teams).

- ***Staff Training, Development and Support:***

Many remote and rural communities are faced with recurrent staff shortages, and further impacted on by particularly high staff turnover. These issues are critical barriers to provision of a range of primary and acute health care services for Indigenous people. These issues thus demand recurrent, sustainable, long term investment in staff training, support and clinical competencies in provision of care for those suffering AMI.

- ***Lack of an Evidence Base:***

There exists very little in the way of comparative outcome data for Indigenous clients suffering from AMI, or for a range of cardiovascular diseases. Developing the systems that help monitor current and future outcomes and process of care indicators for Indigenous clients is an issue of critical importance.

- ***Sudden Cardiac Deaths:***

Similarly, there is little information that serves to define the exact extent to which disproportionate sudden cardiac deaths among Indigenous populations may be contributing to the overwhelming CVD disadvantage. The extent, context and causes of pre-clinic and pre-hospital cardiac deaths may serve to undermine the potential benefits of pre-hospital thrombolysis, and as such, should be assessed in order to develop holistic approaches to CVD within Indigenous communities.

- ***Patient identified barriers to care:***

These have included expression of the cultural inappropriateness of current health care facilities. Failed communication between clients and service providers can be a source of confusion, and as a result, poorer outcomes, acceptance of treatment and follow-up. The extent of institutional racism and its role in elevated cardiac mortality, and efforts to improve the acceptability of services across the care spectrum (primary, transportation, secondary and tertiary care) should be incorporated into the development of systems and programs that serve to decrease preventable mortality among Indigenous populations.

- ***Health Awareness and Promotion:***

In many respects, health education and promotion messages have failed in bridging health information gaps across various ethnic groups. The need for development of messages and processes that focus on symptom recognition, the potential role of atypical chest pain in various ethnic groups (particularly where communication barriers may exist), and improving health care seeking behaviours for those at risk, or suffering AMI must be considered as important targets for future action.

- ***Guidelines, Protocols and Decision Making Tools:***

Despite the evidence of greater patient delays than systematic delays in the small amount of available literature, ensuring prompt, evidence based and streamlined clinical decision making is of critical importance to decreasing the burden of CVD among Indigenous populations. The development of various protocols, guidelines, and appropriate access to specialist decision making must be pursued. These must be easily understood, and able to be followed and supported for a range of settings, including use in remote communities, health centres, by retrieval teams, Aboriginal Health Workers and remote area nurses, Aboriginal Health Services, and a range of hospital settings.

- ***Defibrillators versus Thrombolysis:***

Despite the fact that evidence based care should be available to all those in need, resource limitation and political processes often impact on the availability of a range of services. Various models of pre-hospital thrombolysis should be considered in relation to acute service provision for rural and remote and Indigenous patients. Furthermore, the role, utility, costs and benefits of defibrillators should also be considered in developing systems that serve to decrease mortality and morbidity from AMI. This is of critical importance to the provision of care to rural, remote and many Indigenous communities.

- ***Understanding the Heterogeneity of Indigenous Populations and Communities:***

Awareness of the broad range of issues, understandings, and likely contributors to high CVD mortality among individuals and Indigenous communities requires that systems are developed that can be implemented in varying degrees and with varying methods in individual settings. Indigenous community health services, community controlled services and various regional health services are well placed to inform these decisions. Unfortunately, there is unlikely to be 'one size that fits all' in relation to reducing time to care for those suffering AMI.

- ***Debunking Accepted Fatalism:***

As touched on by Ong and Weeramanthri, and discussed in various forums across the NT, there is limited evidence of an accepted fatalism among Indigenous clients suffering from AMI. One important approach in terms of knowledge, attitudes, awareness and practice modification would be to challenge any such notion that AMIs are routinely fatal, rather than eminently treatable.

- ***Social Construct of Indigenous Heart Disease:***

Developing improved systems to deal with AMI and CVD more holistically requires the understanding of the strong self perceived social construct of heart disease among Indigenous populations. Furthermore, developing systems that do not comprehend or deal with elements of the social determinants of high CVD burdens among Indigenous Australians are destined to perpetuate the large and growing disadvantage faced by Indigenous individuals, families and communities.

■ Conclusions

The pattern, burden and growing disproportionate cardiovascular mortality experienced by Indigenous Australians is a cause for great concern. The enormous relative disadvantage at younger ages in particular, demonstrates a failure of health systems to deal with cardiovascular diseases and their risk factors in any meaningful way. Premature and preventable deaths are an all too common experience for Aboriginal families and are contributing to the high rates of grief, stress and community dysfunction.

From limited available evidence, it seems Indigenous Australians are not able to access important health system resources to prevent CVD and its consequences. Even when Indigenous clients do come into contact with health services, they have poorer access to diagnostic and therapeutic procedures for CVD care. Delays in treatment for those with acute disease and poorer access to necessary, life saving treatment highlights important acute care barriers at the initial interface between clients and health systems. This should be the focus of considerable attention and resources into the coming years if Indigenous health disadvantage is to be stabilized and reversed.

The challenge is set.

References

1. World Health Organisation 1997, *The World Health Report 1997: Conquering suffering, enriching humanity*, WHO, Geneva.
2. Australian Institute of Health and Welfare 2000, *Australia's Health 2000: the seventh biennial health report of the Australian Institute of Health and Welfare*, AGPS, Canberra.
3. Mathers, C., Vos, T., Stevenson, C. 1999, *The Burden of Disease and Injury in Australia*. AIHW cat. No. PHE 17, AIHW, Canberra.
4. Commonwealth Department of Health and Aged Care & Australian Institute of Health and Welfare 1999, *National Health Priority Areas Report: Cardiovascular Health 1998*. AIHW Cat. No. PHE9, HEALTH and AIHW, Canberra.
5. Australian Bureau of Statistics and the Australian Institute of Health and Welfare 2001, *The Health and Welfare of Australian Aboriginal and Torres Strait Islander People*. ABS. Catalogue No. 4704.0. ABS and AIHW, Canberra.
6. Condon, J.R., Warman, G., Arnold, L. (eds) 2001, *The Health and Welfare of Territorians*, Epidemiology Branch, Territory Health Services, Darwin.
7. Brown, A.D.H. 1999, *A comparative analysis of cardiovascular and all-cause mortality in Australia and New Zealand 1984-1996: Is there evidence of widening Indigenous/non-Indigenous differentials?* Masters Thesis, Braun School of Public Health and Community Medicine, Hebrew University, Jerusalem.
8. Beaglehole, R., Dobson, A., Hobbs, M. & Martin, C. 1989, 'CHD in Australia and New Zealand', *International Journal of Epidemiology* 18(3): Suppl 1: S145-148.
9. Higgins, M. & Thom, T. 1989, 'Trends in CHD in the United States', *International Journal of Epidemiology* 8 (Sup 1):S58-S66.
10. O'Dea, K. 1992, 'Diabetes in Australian Aborigines: impact of the western diet and lifestyle', *Journal of Internal Medicine*, 232:103-117.
11. Hoy, W., Mathews, J., McCredie, D., Pugsley, D., Hayhurst, B., Rees, M., Kile, E., Walker, K. & Wang, Z. 1998, 'The multidimensional nature of renal disease: Rates and associations of albuminuria in an Australian Aboriginal community', *Kidney International*, 54: 1296-1304.
12. Gault, A., O'Dea, K., Rowley, K., McLeay, T. & Trianedes, K. 1996, 'Abnormal glucose tolerance and other coronary heart disease risk factors in an isolated Aboriginal community in Central Australia', *Diabetes Care* 19(11) 1269-1273.
13. Australian Institute of Health and Welfare 2001, *Heart, Stroke and vascular diseases – Australian Facts*, AGPS, Canberra.
14. Australian Bureau of Statistics and the Australian Institute of Health and Welfare 1999, *The Health and Welfare of Australia's Aboriginal and Torres Strait Islander Peoples*, ABS Cat No. 4740.0, Canberra.
15. Rowley, K., Walker, K., Cohen, J., Jenkins, A., O'Neal, D., Su, Q., Best, J. & O'Dea, K. 2003, 'Inflammation and vascular endothelial activation in an Aboriginal population: relationships to coronary disease risk factors and nutritional markers', *Medical Journal of Australia* 178: 495-500.
16. Braun, B., Zimmerman, M., Kretchmenr, N., Soargto, R., Smith, R. & Gracey, M. 1996, 'Risk factors for diabetes and cardiovascular disease in young Australian Aborigines. A five year follow up study', *Diabetes Care* 19(5): 472-479.
17. Kuper, H., Marmot, M. & Hemingway, H. 2002, 'Systematic review of prospective cohort studies of psychosocial factors in the aetiology and prognosis of coronary heart disease', *Seminars in Vascular Medicine* 2: 267-314.
18. Rozanski, A., Blumenthal, J., & Kaplan, J. 1999, 'Impact of psychosocial factors on the pathogenesis of cardiovascular disease and implications for therapy', *Circulation* 99 2192-2217.
19. Eriksen, W. 1994, 'The role of social support in the pathogenesis of coronary heart disease: a literature review', *Family Practice* 11: 201-209.
20. Tennant, C. 1999, 'Life stress, social support and coronary heart disease', *Australia and New Zealand Journal of Psychiatry* 33: 636-641.