

Inequalities in care in patients with acute myocardial infarction

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Conflict-of-interest statement: There is no conflict of interest.

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Received: June 22, 2015

Peer-review started: June 26, 2015

First decision: August 10, 2015

Revised: September 24, 2015

Accepted: October 12, 2015

Article in press: October 13, 2015

Published online: December 26, 2015

Abstract

Coronary heart disease is the single largest cause of death in developed countries. Guidelines exist for the management of acute myocardial infarction (AMI), yet despite these, significant inequalities exist in the care of these patients. The elderly, deprived socioeconomic groups, females and non-caucasians are the patient populations where practice tends to deviate more frequently from the evidence base. Elderly patients often had higher mortality rates after having an AMI compared to younger patients. They also tended to present with symptoms that were not entirely consistent with an AMI, thus partially contributing to the inequalities in care that is seen between younger and older patients. Furthermore the lack of guidelines in the elderly age group presenting with AMI can often make decision making challenging and may account for the discrepancies in care that are prevalent between younger and older patients. Other patients such as those from a lower socioeconomic group, *i.e.*, low income and less than high school education often had poorer health and reduced life expectancy compared to patients from a higher socioeconomic group after an AMI. Lower socioeconomic status was also seen to be contributing to racial and geographical variation in the care in AMI patients. Females with an AMI were treated less aggressively and had poorer outcomes when compared to males. However even when females were treated in the same way they continued to have higher in hospital mortality which suggests that gender may well account for differences in outcomes. The purpose of this review is to identify the inequalities in care for patients who present with an AMI and explore potential reasons for why these occur. Greater attention to the management and a better understanding of the root causes of these inequalities in care may help to reduce morbidity and mortality rates associated with AMI.

Key words: Coronary artery disease; Dual antiplatelet

therapy; Inequalities; Guidelines; Myocardial infarction

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Core tip: Coronary heart disease is the leading cause of death in developed countries. Guidelines exist for the management of acute myocardial infarction (AMI), yet despite these, significant inequalities exist in patient care. The elderly, deprived socioeconomic groups, females and non-Caucasians are the patient populations where practice tends to deviate from the evidence base. The purpose of this review article is to identify the inequalities in those who present with an AMI and explore potential reasons for this. Greater attention to the management and a better understanding of the root causes of these inequalities may help to reduce morbidity and mortality rates.

Rashid S, Simms A, Batin P, Kurian J, Gale CP. Inequalities in care in patients with acute myocardial infarction. *World J Cardiol* 2015; 7(12): 895-901 Available from: URL: <http://www.wjgnet.com/1949-8462/full/v7/i12/895.htm> DOI: <http://dx.doi.org/10.4330/wjc.v7.i12.895>

INTRODUCTION

Coronary heart disease is the leading cause of death in the world and accounted for 7.4 million deaths in 2012^[1]. In Europe the mortality per annum from coronary heart disease is 20%^[2] and 25% in the United States^[3]. Guidelines exist to aid with the management of patients who present with acute myocardial infarction (AMI)^[4-7] yet inequalities in the management and outcomes of these patients are clearly apparent.

The World Health Organisation defines inequality in health care as avoidable inequalities in health between groups of people within countries and between countries^[8]. Factors that drive care inequality can be defined as biological for instance age and gender, socioeconomic, race/ethnicity or geographical. In this review article, we describe the inequalities in care for patients presenting with AMI and explore the potential reasons for inequity in AMI care.

Age differences

Life expectancy is increasing in the United Kingdom and much of the developed world. From 2003 to 2010 life expectancy increased from 76.5 to 78.1 years for males and 80.9 to 82.1 years for females. AMI accounted for the majority of deaths in the United Kingdom in 2012 especially in those individuals over the age of 85 years^[9]. Age is a risk factor for AMI and poorer prognosis thereafter, and with the rising life expectancy this will lead to a greater number of patients presenting with AMI with potentially greater morbidity and mortality^[9-11].

Data from the Myocardial Ischemia National Audit Project (MINAP), a multicentre clinical registry for

patients who have been hospitalised with a myocardial infarction in England and Wales demonstrated that in-hospital mortality in 2010 following a myocardial infarction was 20.4% in those ≥ 85 years compared to 0.9% in those < 55 years old^[10,11]. In part, greater frailty and co-morbidity in older patients explain this variation in outcome. However, the provision of evidenced based care to older patients was significantly lower than that provided to younger patients following an AMI. For instance, MINAP data showed that up to 75% of patients ≥ 85 years presenting with a ST segment myocardial infarction (STEMI) were less likely to receive thrombolysis or primary percutaneous coronary intervention (PPCI) compared to those < 55 years^[11,12]. Furthermore, although evidence suggests benefit in the use of anti-platelets and statins in the elderly following an AMI^[13], the use of such therapies are not equivocal across age groups. For example, in-hospital use of aspirin for those < 65 years was 95% vs 87% in those ≥ 85 years of age^[14,15]. Thus, strategies targeting improved adherence to evidenced based treatments in the elderly may narrow the inequality in outcomes.

Nevertheless, outcomes after an AMI have improved over time across all age groups. This is partly due to better therapeutic options and treatments, such as, PPCI for STEMI that has a better safety profile in elderly patients compared to thrombolytic therapy^[16]. In 2004 PPCI rates for all elderly STEMI patients was 2.0% vs 36.1% in 2009. During the same time period, 11.5% and 25.5% of elderly patients had coronary angiography following AMI. The rate of prescription of secondary medications increased in all age groups but a greater rate of change was observed in those ≥ 85 years compared to those < 55 years old from 2003 to 2010: 28% to 89% vs 56% to 97%, respectively^[12].

In addition to higher mortality following an AMI, elderly patients have more frequent complications and greater risk of physical de-conditioning compared to younger patients^[17]. Indeed, the latter can be improved by interventions such as cardiac rehabilitation (CR) programmes, yet the overall rates of participation in CR are relatively low^[18,19] especially in the elderly^[20,21]. Greater awareness by the caring Physician of the benefits of CR might help improve care and outcomes post AMI as recommendation by a Physician was a strong predictor of CR uptake^[21].

The better evidenced based care provided to younger patients following an AMI might explain the continued variation in outcome compared to older counterparts. Understanding the reasons for this inequality is paramount if care and outcomes are to be improved. It is likely that the reasons for this variation are multifactorial. For instance, elderly patients have a greater degree of co-morbidity such as anaemia, cerebrovascular disease and dementia which potentially provides a further barrier to the use of AMI therapies^[14,22]. For instance, older patients with dementia had lower rates of evidenced based treatment than elderly patients without dementia, 44% vs 62%, respectively. Such variation may occur as

patients with dementia often need prompting to ensure compliance with medications. Non-compliance with dual antiplatelet therapy after percutaneous coronary intervention (PCI) may lead to significant implications such as a further AMI. Advanced dementia may signify to the caring Physicians that evidence based therapies have less long term benefit and subsequently have a higher threshold to prescribe such treatments. Other factors such as frailty may preclude invasive treatment^[23] as there is the perception that the patient is likely to gain more harm than benefit from advanced treatments. Clinicians may be reluctant to prescribe dual antiplatelet therapy or list patients for cardiac catheterisation in the presence of anaemia^[24], more commonly seen in the elderly. Such clinical concerns highlight the potential risk of therapies and may encourage decisions that are risk adverse, aiming to do no harm in the first instance.

There is little evidence base to help guide care decisions in elderly patients with AMI. For instance, advanced age is often an exclusion criteria in coronary heart disease trials^[25]. Only 9% of all trials included those ≥ 75 years and 2% included those ≥ 85 years of age. The elderly patients included in these trials had less risk factors for coronary heart disease, fewer comorbidities, better kidney function and haemodynamics on presentation to hospital compared to similar aged patients that are seen in real life practice^[14]. This highlights a lack of clarity in the evidence base for managing older patients and underpins further the uncertainty in treating patients in the more conventional way seen in younger patients with an AMI.

Additionally, elderly patients are more likely to present with atypical symptoms of an AMI. For example, only 40% of those ≥ 85 years with an AMI had chest pain compared to 77% of those < 65 years. Indeed, they were more likely to present with dyspnoea (49%) but less commonly with nausea and vomiting (24%) or syncope (19%)^[14]. Due to the atypical presentation, these patients are often misdiagnosed and therefore not receive timely recommended therapies which maybe contributing to the greater morbidity and mortality^[26]. Furthermore, 40% of patients with an AMI ≥ 85 years of age did not have diagnostic electrocardiogram changes compatible with AMI compared to 25% of patients < 65 years^[14]. Even when the diagnosis of AMI has been established, those > 80 years were less likely to be admitted under cardiology care compared to patients < 65 years of age (39.1% vs 64%, respectively)^[27], despite evidence to suggest care by a cardiologist improved outcomes^[25].

Guidelines recommend using risk scoring systems to identify those individuals at high risk after an AMI^[5-7,28,29] and who may potentially benefit from invasive and aggressive therapies. Clinicians often subjectively assess individuals risk by taking into account other comorbidities that are not incorporated into clinical risk scores^[30]. There is poor correlation between the perceived risk judged by physicians and actual validated risk scores^[31]. Equally age is a major driver of heightened

risk in risk scores, such as, the Global Registry of Acute Coronary Events (GRACE) and thus most elderly patients would be in a high risk group post AMI^[32]. This suggest that physician decisions are potentially influenced by other factors not represented in the risk scores, such as perceived frailty, and highlights the difficult in driving optimum AMI care in the elderly.

With the aging population, it is likely that the number of elderly patients presenting with AMI will increase. This will have a significant impact on morbidity and mortality as well as health care resources. Several societies including the American College of Cardiology, American Heart Association and the European Society of Cardiology guidelines on non STEMI (NSTEMI) advocate the use of intensive and early interventional therapies in high risk groups^[5-7], such as the elderly, who are likely to achieve better outcomes if therapies for AMI are advocated, although this is confounded by the lack of a strong evidence base. Thus, uncertainty of risk vs benefit of AMI therapies in elderly patients makes decisions around the use of effective therapies difficult. In part, unmodifiable risk factors associated with age drive the disparity in outcomes post AMI between young and old. However, whilst inequalities in care exist across age groups there is still potential to narrow the gap in adverse outcomes by improved provision of evidence based care to older patients post AMI.

Socioeconomic factors

The socioeconomic status of patients can be defined according to the patient's occupation, income wealth, education or where they live^[33]. Lower socioeconomic status, *i.e.*, low income, less than high school education, is a key determinant of inequality in care and results in these individuals experiencing poor health and reduced life expectancy. Studies from Sweden, Finland, Canada and the United States have found that prognosis is worse after an AMI in patients from a lower socioeconomic status group^[34-36]. In a study conducted in Finland, a higher number of patients with lower socioeconomic status had AMI's and lower prescription of secondary prevention medication compared to the higher socioeconomic group. These patients often presented later to hospital with chest pain^[21,36] and higher numbers were treated in urban hospitals compared to their counterparts who were treated in specialist hospitals^[36]. This may have been because specialist centres were situated in more affluent areas. In addition poorer patients were likely to refuse invasive procedures^[37]. Mortality rates were also significantly higher in patients with a low income and basic education. Males with a low income had a 28 d mortality rate of 49.5% compared with 14.5% of those with higher income. In males who had a basic level of education 28 d mortality rate was 80.3% and 19.7% in those with higher education. A similar trend was also seen in females^[36]. This suggests that low income and potentially a lack of understanding of physical health contributes to these findings.

In the United States, patients of a lower socioe-

conomic status were less likely to proceed to a coronary angiogram within 24 h of a STEMI compared to those with a higher socioeconomic status (69.5% vs 73.7%) or within 48 h of a NSTEMI (47.6% vs 51.8%). Probable reasons included, those from a lower socioeconomic group were less educated about their co-morbidities, did not have consistent medical records and were unable to obtain anti-platelets therapies reliably. Therefore physicians often spent longer trying to establish if there were any contraindications to anti-platelet therapy. In contrast, individuals from a higher socioeconomic status had higher expectations for early treatment to be instituted when presenting with chest pain. They also tended to receive more frequently drug eluting stents, possibly because their level of insurance covered the cost of the procedure. However, the perception of the operating physician, that a patient was of a higher socioeconomic status, was independently related to higher drug eluting stent use than level of insurance as this was not checked prior to procedure in all patients^[38].

Poor health was further contributed by factors such as occupational stress, social isolation and depression which are seen more frequently in the lower socioeconomic groups^[35]. On the other hand, some therapies were equally provided across socioeconomic groups. For example, there were no significant differences in patients referred for coronary artery bypass grafting (CABG) post AMI in the United States. It was speculated that patients of a lower socioeconomic status were likely to have severe and more complex coronary artery disease making them appropriate for CABG rather than PCI. This would also resolve the problem of compliance with dual antiplatelet therapy which is required post PCI^[38]. On the other hand, if the lower socioeconomic group had coronary disease more suitable for CABG, one would expect the referral rate for CABG to exceed the higher socioeconomic group. However, rates of CABG referral between the two groups were comparable. This might suggest that either those of lower socioeconomic class were under-referred for CABG or those in higher socioeconomic were over-referred for CABG.

Intriguingly, MINAP data from 2003 to 2007 in England and Wales, suggested that there was no socioeconomic differences in the management of patients with AMI^[39]. This is likely explained by differences in the healthcare systems with the United States being predominantly paid for through medical insurance whilst in the United Kingdom, a nationally funded service offers universal access to care at the point of need.

Racial and ethnic factors

Within racial and ethnic groups there is variation in the way AMI patients are treated. In the United States, the national registry of myocardial infarction from 1994-2002 showed that black (not well defined as to whether these were Afro-Caribbean patients or black United States patients) patients received less coronary reperfusion therapy and coronary angiography compared to Caucasian patients^[37,40,41]. Compared to Caucasians,

Afro-Caribbean females were less aggressively treated and had higher in hospital mortality^[40]. Reasons for such differences were unclear, but may be related to socioeconomic factors rather than race alone.

Data from hospital discharges in the state of Pennsylvania between 2003 and 2004 showed that 46% of Caucasian patients underwent PPCI compared to 40% of African Americans because more than often African American patients presented later to hospitals at which point the benefit of PPCI had elapsed^[37].

In Singapore and Malaysia, ethnic variations in the treatment of patients with an AMI were prevalent. Ethnicity is defined as groups of people who identify with each other based on social and cultural experience. Malays had the least invasive treatment and had the highest mortality rate after an AMI compared to the Indians and the Chinese^[42,43]. The level of education and household income may have contributed to these differences. In 2000, less than 5% of Malays in Singapore progressed to higher education compared to nearly 20% of Chinese and Indians^[43]. Education and income both act together to enhance health and reduce the need for health care. Provision of education may serve as a key strategy to reduce disparities in AMI care.

In the United Kingdom there is a paucity of data regarding AMI care between different racial groups.

Gender differences

Studies in the United States, Switzerland, United Kingdom and France demonstrate gender differences in AMI treatment. PCI rates were lower in females compared to males (14.2% vs 24.4% respectively)^[44]. Females that presented with an AMI were generally older than men with greater co-morbidities and presented later to hospital^[45,46]. The latter point may drive some of the variation seen with PCI rates as late presenters would derive less benefit. Furthermore, females with an AMI more frequently had non obstructive coronary atheroma therefore precluding the need for any interventional therapy^[44]. There is also evidence to suggest that females are less inclined to consent to coronary angiography compared to males^[47].

Similar findings were seen in England, with females compared to males, less likely to be given thrombolytic therapy (37% vs 46%), aspirin (83% vs 90%), have angiography, exercise testing or revascularisation. However when adjusted for age these inequalities were less apparent but poor outcome was statistically higher in females than males yet, despite females being higher risk partly due to age and co-morbidity they were treated less aggressively than males^[46,48,49]. However, it is difficult to know if this now represents contemporary practice as this data precedes 2000.

Even when females were treated in the same way as males there was still higher in hospital mortality despite correction by age, co-morbidities, haemodynamic status and time to treatment. Mortality rates in females were 2.3 times higher in comparison to males (7.9% vs 2.3% respectively). Furthermore hypotension and shock was

more prevalent in females despite the degree of left ventricular systolic impairment being the same in the male group. This suggests that gender in itself may account for the differences in outcomes^[50]. Inequalities in care between the genders are not fully understood and like elderly patients, females have historically been under represented in clinical trials.

Geographic variation

GRACE looked at the management of patients with AMI from 95 hospitals from 14 countries including Europe, North and South America, Australia and New Zealand. Aspirin and ACE inhibitor use was similar across all regions with over 91% receiving Aspirin on admission. There was geographical variation in the discharge use of statin, ranging from 26% to 57%. This was due to the uncertainty about the benefit of statins acutely. Furthermore the United States appeared to use more Glycoprotein II b/IIIa inhibitors compared to other countries, explained by United States GRACE centres having more direct access to coronary angiography facilities^[51]. Post AMI 30 d and 1 year mortality varied in 458 hospitals across 24 countries, 5.0% to 13.9% and 4.9% to 14.8%, respectively. However, patient level factors, such as socioeconomic status accounted for most of this variation (96% to 99%) whilst hospital level factors at most accounted for 4% of variation in post AMI outcome^[48]. Similar findings were reported in other studies^[52,53].

Old practice data from 1998 comparing AMI treatments in the United States and the United Kingdom revealed that coronary angiography was performed in 61% vs 22% of cases respectively. United States patients were more likely to receive coronary revascularisation, 69% vs 41%, respectively, although the extent of coronary disease was similar between the two patient groups. The greater availability in coronary angiography and revascularisation in the United States may have accounted for these findings at the time. There were no significant differences in the primary end points of recurrent angina, myocardial infarction and death in the United States (29%) compared to the United Kingdom (25%)^[54]. It is not clear how differences in the two healthcare systems and how they are funded affected the variation in care provided to AMI patients.

Geographical variation in AMI care is likely driven by several factors including the economical strength of countries or the way healthcare systems are funded, which makes comparisons difficult.

CONCLUSION

Inequalities in the treatment of an AMI are described with regards to age, socioeconomic factors, race, gender and geographical location. Age is known to be a risk factor for an AMI and with the aging population more patients are predicted to have an AMI, resulting in a significant impact on morbidity, mortality and healthcare resources. The inequality in care between younger

and older patients suggests that older patients may still gain a survival benefit by equalising the disparity in care by simple measures such as ensuring guideline recommended care being provided to more elderly patients. There is an increasing need for further research to guide optimum care of elderly patients post AMI. Clinicians taking a more proactive role in the treatment of these patients may further narrow the gap between the young and the old. A similar model in the care of elderly patients following orthopaedic surgery has been successful with the evolution of the Ortho-geriatrician. Females had the highest mortality and given that they make up 50% of the global population it is imperative that treatment is equalised. Further research is required to help understand the inequality of care that exists amongst females and ultimately guide further AMI management.

Further discrepancies were seen between the higher and lower socioeconomic groups with the latter experiencing poor healthcare. Furthermore, Lower socioeconomic status probably accounted for geographical and racial variation. Socioeconomic status is strongly linked to education which also potentially allows the understanding and prevention of illness, control of risk factors and compliance to medications as well as a determinant of higher income. This would therefore suggest that education is a fundamental component but outside the influence of the medical sphere.

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P- Reviewer: Petix NR, Teragawa H **S- Editor:** Qiu S
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