

Increasing Cardiac Interventions among the Aged

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Abstract

Ireland's over 65 year population is growing. As incidence of coronary events rises with age, there is a growing population of elderly patients with cardiac disease. The changing age profile of patients treated by a tertiary hospital's Cardiology service was quantified using Hospital Inpatient Enquiry data. 53% of CCU admissions were aged ≥ 65 years, with admissions aged ≥ 85 years in 2008 four times greater than in 2002. Percentages of patients undergoing diagnostic coronary angiography and percutaneous coronary interventions in 1997 aged ≥ 70 years were 19% and 18% respectively. By 2007, these percentages had risen to 31% and 34% respectively - greatest increases were in the very elderly age categories. The proportion of ICD recipients aged > 70 years increased from 8% in 2003 to 25% by 2008. The proportion of elderly patients receiving advanced cardiac care is increasing. This trend will continue and has clear resource implications. Outcomes of interventions in the very old need further investigation, since the ≥ 80 old are under-represented in clinical trials.

Introduction

Ireland is rapidly growing older. In 2006, there were 467,926 people over the age of 65 years living in the Republic of Ireland - 11% of the total population¹. This represented a 12% increase in this demographic group over the decade since 1997, with rapid growth projected to continue, rising to 1.4 million or 25% of the population by 2041. A fourfold increase in the population over the age of 85 is projected over the same timeframe from 110,000 to 440,000 persons². The average life expectancies for a 75 year old male and female living in Ireland are 8.9 and 11.2 years respectively³. Those aged 65 or over are our greater health consumers accounting for 48.7% of all acute hospital bed days and 28% of all hospital day cases in 2005⁴. The average length of stay in hospital increases with advancing age (see Figure 1). The mean length of stay in hospitals for persons aged 65 years or over of 11.5 days is more than double the mean for persons under 65 years of 4.6 days⁵.

The incidence of both coronary artery disease (CAD) and heart failure rise steeply with age and thus the prevalence of these diseases increases in an ageing population^{6,7}. The current and projected treatment burden for the Irish health system of cardiac disease among elderly patients is significant, particular when increasingly expensive treatment advances such as drug eluting stents, implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) are considered. There are limited trial data to guide the care of elderly patients presenting with cardiac disease, as this patient subgroup has been under-represented in trials. In particular, the very elderly are under-represented in randomised trials^{8,9}. Available data are often from retrospective studies involving small number of patients. This has led to uncertainty about benefits and risks of invasive treatment strategies in the setting of advanced age and a traditional tendency to favour conservative management for older patients. Given the population change of the past decade and increasing use of invasive treatment strategies among elderly patients, we set out to quantify the temporal change that has occurred in the age profile of patients admitted to the Coronary Care Units (CCU) and undergoing cardiac interventions in an Irish tertiary referral, teaching hospital.

Methods

The numbers of patients in each age category admitted to CCU, receiving implantable cardioverter defibrillators (ICDs) and undergoing diagnostic coronary angiography and percutaneous coronary intervention (PCI) each year from 1997 until 2008 were obtained from Hospital Inpatient Enquiry (HIPE) data of the Mater Misericordiae University Hospital Dublin. The trends over time in age profiles of patients admitted to CCU or undergoing cardiac interventions were analysed.

Figure 1: Average length of stay in hospital by age group in 2003. [Modified from Health Statistics 2005: Section H \hat{a} Acute Hospital Services, Figure 3; Department of Health and Children].

Figure 2: Percentage of annual CCU admissions by age category

Results

In 2008, 53% (297 of 564) of all patients admitted to CCU were aged ≥ 65 years, and 28% (160 of 564) were aged ≥ 75 years. The percentages of total CCU admissions in the so called \hat{a} very old \hat{a} age categories have increased in recent years. For example, the percentage of total CCU admissions aged ≥ 85 years in 2008 (44 of 564, 8%) was four times greater than in 2002 (13 of 616, 2%) as is illustrated in Figure 2. In 1997, 19% (341 of 1820) of patients undergoing diagnostic coronary angiography were aged ≥ 70 years. 31% (636 of 2079) of all diagnostic coronary angiograms in 2007 were performed in patients ≥ 70 years.

Figure 3: Percentage of annual diagnostic coronary angiograms and annual PCIs by age group in 1997 and in 2007

Figure 4: Percentage of patients receiving ICDs aged ≥ 70 years by year. For each year, the number of patients aged ≥ 70 years (n) and the total number of patients receiving ICDs (N) is shown (n of N)

This represents a 63% increase over a single decade in the proportion of all patients undergoing diagnostic coronary angiograms who are over the age of 70. Similarly, the percentages of all patients undergoing PCI in 1997 and 2007 who were aged ≥ 70 years were 18% and 34% respectively - an increase of 89% over one decade. When the breakdown of coronary angiograms and PCIs for 1997 and 2007 by age category is reviewed, it is evident that the greatest increases are seen in the proportion of patients in the 'very old' age categories undergoing these procedures (Figure 3). There has been an increase in the proportion of patients receiving ICDs annually who are over the age of 70 in recent years (see Figure 4).

Discussion

The proportion of patients admitted to CCU and undergoing cardiac interventions who are age 70 years is significant. These findings are in keeping with international observations - 36-43% of patients admitted to CCUs with non-ST elevation ACS (NSTEMI-ACS) are reported to be over the age of 70 years^{10,11}; while 32% and 11% of patients undergoing PCIs are reported to be aged ≥ 70 years and ≥ 80 years respectively^{12,13}. Over the past decade, the greatest increases have been seen in the proportion of patients admitted to CCU and undergoing cardiac interventions who are in the so called 'very elderly' age categories i.e. > 75 year age categories. Patients with cardiovascular disease in these age categories represent a higher risk cohort due to greater comorbidities^{6,7} and have been under-represented in clinical trials. Conservative management is traditionally preferred for cardiac disease in the 'very old'. An age of 75 years or more has been identified as a strong negative predictor of the use of cardiac catheterisation and early PCI among patients with NSTEMI-ACS^{8,9}. However, this age bias in selecting patients for invasive cardiac interventions is being challenged as increasing evidence emerges to support the benefits of such interventions in the elderly. Elderly patients with both stable CAD as well as ACS have been shown to benefit from an early invasive approach with relatively low morbidity and mortality^{14,15,16}; however, post-procedure morbidity and mortality do appear higher among octogenarians and nonagenarians requiring emergent rather than elective interventions^{6,20}.

The proportion of annual recipients of ICDs aged > 70 years is increasing - 25% of all patients receiving ICDs in 2008 were over the age of 70 years. The mean patient age in the ICD and CRT trials was only 60-65 years, with few patients in these trials aged > 75 years. To date, available evidence to suggest benefits of these therapies are independent of age come largely from small, retrospective studies^{21,22}. There is a recognised need for prospective trials of contemporary invasive and non-invasive cardiac therapies to enroll elderly subjects proportionate to their prevalence among the treated population to clarify risk, benefit and cost effectiveness of such therapies in the various elderly age categories.

In conclusion, elderly patients account for a significant proportion of the workload of an acute Irish Cardiology service and the proportion of patients in the 'very elderly' age categories receiving advanced cardiac care has increased over the past decade. This trend is set to continue given the projected growth for elderly age groups in Ireland over coming decades. Satisfying the care needs of a growing population of elderly patients with cardiac disease will challenge a stretched health service. Furthermore, this population represents a very heterogeneous subgroup of patients ranging from the remarkably robust to very frail, and so challenge their physicians by necessitating individualised decisions on management rather than age-governed treatment strategies.

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References

- <http://www.cso.ie/statistics/popnbyage2006.htm>
- http://www.cso.ie/census/documents/Projections_2011-2041.pdf
- Central Statistics Office. Irish Life Tables 2001-2003.
- Central Statistics Office. Ageing in Ireland 2007. Page 17.
- Health Statistics 2005. Department of Health and Children.
- Lerner DJ, Kannel WB. Patterns of coronary heart disease morbidity and mortality in the sexes: a 26-year follow-up of the Framingham population. *Am Heart J* 1986; 111: 383-90.
- Bleumink GS, Knetsch AM, Sturkenboom MC, Straus SM, Hofman A, Deckers JW, Witteman JC, Stricker BH. Quantifying the heart failure epidemic: prevalence, incidence rate, lifetime risk and prognosis of heart failure The Rotterdam Study. *Eur Heart J* 2004; 25:1614-9.
- Merchant FM, Weiner RB, Rao SR, Lawrence R, Healy JL, Pomerantsev E, Rosenfield K, Jang IK. In-hospital outcomes of emergent and elective percutaneous coronary interventions in octogenarians. *Coron Artery Dis*. 2009; 20:118-23
- Liistro F, Colombo A. Coronary angioplasty in elderly patients. *Ital Heart J Suppl*. 2002;3:1-8.
- De Servi S, Cavallini C, Dellavalle A, Santoro GM, Bonizzoni E, Marzocchi A, Politi A, Pesaresi A, Mariani M, Chierchia S; ROSAI-2 Investigators. Non-ST-elevation acute coronary syndrome in the elderly: treatment strategies and 30-day outcome. *Am Heart J*. 2004; 147:830-6.
- Devlin G, Gore JM, Elliott J, Wijesinghe N, Eagle KA, Avezum A, Huang W, Brieger D; GRACE Investigators. Management and 6-month outcomes in elderly and very elderly patients with high-risk non-ST elevation acute coronary syndromes: The Global Registry of Acute Coronary Events. *Eur Heart J* 2008; 29:1275-82.
- Yan BP, Gurvitch R, Duffy SJ, Clark DJ, Sebastian M, New G, Warren R, Lefkowitz J, Lew R, Brennan AL, Reid C, Andrianopoulos N, Ajani AE. An evaluation of octogenarians undergoing percutaneous coronary intervention from the Melbourne Interventional Group registry. *Catheter Cardiovasc Interv* 2007; 70:928-36.
- Bossi I, Piccaluga E, Scatturin M, Corvaja N, Pasquetto G, Steffanon L, Oberhollenzer R, Colombo P, Bolognese L, Savonitto S. Percutaneous coronary interventions in elderly patients: clinical indications and adjunctive medical treatment. The Italian Drug Evaluation in Angioplasty (IDEA) study. *G Ital Cardio (Rome)* 2006; 7:136-44.
- Bagnall AJ, Goodman SG, Fox KA, Yan RT, Gore JM, Cheema AN, Huynh T, Chauret D, Fitchett DH, Langer A, Yan AT; Canadian Acute Coronary Syndrome Registry I and II Investigators; Canadian Global Registry of Acute Coronary Events (GRACE/GRACE2) Investigators. Influence of age on use of cardiac catheterization and associated outcomes in patients with non-ST elevation acute coronary syndromes. *Am J Cardiol* 2009; 103:1530-6.
- Pfisterer M, Buser P, Osswald S, Allemann U, Amann W, Angehrn W, Eeckhout E, Erne P, Estlinbaum W, Kuster G, Moccetti T, Naegeli B, Rickenbacher P; Trial of Invasive versus Medical therapy in Elderly patients (TIME) Investigators. Outcome of elderly patients with chronic symptomatic coronary artery disease with an invasive vs optimized medical treatment strategy: one-year results of the randomized TIME trial. *JAMA* 2003; 289:1117-23.
- Trial of Invasive versus Medical therapy in Elderly patients (TIME) Investigators. Trial of invasive versus medical therapy in elderly patients with chronic symptomatic coronary artery disease (TIME): a randomized trial. *Lancet* 2001; 358:951-7.
- Pfisterer M. Trial of Invasive versus Medical therapy in Elderly patients Investigators. Long-term outcome in elderly patients with chronic angina managed invasively versus by optimized medical therapy: four-year follow-up of the randomized Trial of Invasive versus Medical therapy in Elderly patients (TIME). *Circulation* 2004; 110:1213-8.
- Bonetti PO, Kaiser C, Zellweger MJ, Grize L, Erne P, Schoenenberger RA, Pfisterer ME; TIME Investigators. Long term benefits and limitations of combined antianginal drug therapy in elderly patients with symptomatic chronic coronary artery disease. *J Cardiovasc Pharmacol Ther* 2005; 10:29-37.
- From AM, Rihal CS, Lennon RJ, Holmes DR Jr, Prasad A. Temporal trends and improved outcomes of percutaneous coronary revascularization in nonagenarians. *JACC Cardiovasc Interv* 2008;1:692-8.

20. Teplitsky I, Assali A, Lev E, Brosh D, Vaknin-Assa H, Kornowski R. Results of percutaneous coronary interventions in patients > or = 90 years of age. *Catheter Cardiovasc Interv* 2007; 70:937-43.
21. Kron J, Aranda JM Jr, Miles WM, Burkart TA, Woo GW, Saxonhouse SJ, Sears SF Jr, Conti JB. Benefit of cardiac resynchronization in elderly patients: results from the Multicenter InSync Randomized Clinical Evaluation (MIRACLE) and Multicenter InSync ICD Randomized Clinical Evaluation (MIRACLE-ICD) trials. *J Interv Card Electrophysiol* 2009; 25:91-6.
22. Duray G, Richter S, Manegold J, Israel CW, Gröfelfeld G, Hohnloser SH. Efficacy and safety of ICD therapy in a population of elderly patients treated with optimal background medication. *J Interv Card Electrophysiol* 2005; 14:169-73.
23. Alexander KP, Newby LK, Cannon CP, Armstrong PW, Gibler WB, Rich MW, Van de Werf F, White HD, Weaver WD, Naylor MD, Gore JM, Krumholz HM, Ohman EM; American Heart Association Council on Clinical Cardiology; Society of Geriatric Cardiology. Acute coronary care in the elderly, part I: Non-ST-segment-elevation acute coronary syndromes: a scientific statement for healthcare professionals from the American Heart Association Council on Clinical Cardiology: in collaboration with the Society of Geriatric Cardiology. *Circulation* 2007; 115:2549-69.