

## Clinical audit

# ACE inhibitors and heart failure in hospital: any difference between cardiologists and general physicians?

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### Summary

**Cardiologists and generalists have been reported to diverge in terms of their self-reported use of angiotensin-converting enzyme (ACE) inhibitors, but information on their actual use of ACE inhibitors has been lacking. In order to assess ACE inhibitor use in patients with heart failure in a teaching hospital and any differences between specialties we studied all patients in the Western Infirmary of Glasgow between 1 April and 1 October 1996 with an echocardiogram showing moderate or severe left ventricular systolic dysfunction ( $n=236$ ). We found that most patients were on an ACE inhibitor (66%), 12% had been tried but found to be intolerant, 10% had not been tried because of a contraindication, but 12% had not been tried despite no contraindication. Of those on treatment, 58% were on a dose used in a major survival study (38% of all patients). Most patients were treated by a cardiologist (64%). Of these, more were on an ACE inhibitor (77% vs 53%,  $p<0.01$ ), fewer had been tried but found intolerant (11% vs 18%), and fewer had never been tried (11% vs 29%,  $p<0.01$ ), irrespective of whether they had a contraindication (5% vs 18%,  $p<0.01$ ) or not (6% vs 12%). More were on a dose used in a major survival study (48% vs 31%,  $p<0.05$ ). We conclude that, despite improvements over time, ACE inhibitors are still under-used, sometimes without good reason. There are also differences in the use of ACE inhibitors between cardiologists and generalists which may affect outcome, and could affect resource utilisation.**

**Keywords:** heart failure; ACE inhibitors; audit

It is well known that ACE inhibitors improve symptoms,<sup>1</sup> prolong life,<sup>2</sup> prevent hospitalisation for heart failure,<sup>3</sup> and save money,<sup>4</sup> in the treatment of patients with chronic heart failure. Despite this, it is clear that a substantial proportion of patients are not getting the treatment they need.<sup>5</sup> One reason for this is inadequate investigation of patients with heart failure,<sup>6</sup> but this cannot explain the whole of the deficit. Less well known are the reasons why patients with well-characterised heart failure might not receive appropriate treatment. With

this in mind, we set about an audit of patients with unambiguous evidence of heart failure, in what should be a centre of excellence, as treated by both specialists and generalists.

### Patients and methods

We audited the report of every echocardiogram performed in the cardiology department of the Western Infirmary of Glasgow between 1 April and 1 October 1996. In our hospital, the vast majority of assessments of left ventricular function are made by echocardiography, rather than radionuclide scanning or contrast ventriculography. They were all performed by an echocardiography technician and reported by cardiology trainees, and all reports included an evaluation of left ventricular systolic function, which was categorised as normal or impaired, with mild, moderate, or severe impairment. Semi-quantitative assessment has previously been shown to correlate closely with formal echocardiographic and radionuclide measurement of left ventricular ejection fraction.<sup>7-9</sup> All patients with moderate or severe impairment of left ventricular systolic function (assumed to equate with an ejection fraction of less than 40%) were identified, regardless of co-pathology. These patients' case sheets were obtained and audited for use of ACE inhibitors (past, present or planned), reasons for not using ACE inhibitors and specialty of the practitioner in charge of the patient. Specialty was categorised as cardiology, general medicine (comprising a number of specialists or sub-specialists in other areas, all of whom do a regular general medical 'take' and run a general medical out-patient clinic), geriatrics, or other (comprising cardiothoracic surgery, vascular surgery, general surgery, respiratory and oncology).

To allow comparison of doses between patients treated with different ACE inhibitors, daily doses were related to the target doses in major survival studies (or the dose given in the British National Formulary in cases where no major survival study was applicable). Enalapril 20 mg,<sup>10</sup> lisinopril 10 mg,<sup>11</sup> captopril 150 mg,<sup>12</sup> perindopril 4 mg,<sup>13</sup> quinapril 20 mg,<sup>14</sup> fosinopril 40 mg<sup>13</sup> and trandolapril 4 mg<sup>15</sup> were assumed to be equivalent and to equate with 'full-dose' ACE inhibition.

Statistical comparisons were made using a two-sample *t*-test or chi-squared test as appropriate. Yates' correction was applied as required.

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## Results

During the 6 months of the study over 2500 echocardiograms were performed and audited, and 243 echocardiograms showing moderate or severe left ventricular systolic dysfunction were detected. Of these, 236 could be related to definite in-patient or out-patient episodes. All 236 case sheets were obtained and no patients were excluded from the study. The mean age was 68 years; 155 (66%) were male, and 193 (82%) were alive at the time of audit (on average, 6 months after echocardiography).

Of all the patients, 156 (66%) were on an ACE inhibitor, 28 (12%) had been tried on an ACE inhibitor but had been found to be intolerant, 24 (10%) had never been tried on an ACE inhibitor because of a perceived contraindication, and 28 (12%) had never been tried on an ACE inhibitor despite no apparent contraindication. Table 1 shows the reasons for stopping an ACE inhibitor in those tried but found to be intolerant, and table 2 shows the reasons for not starting an ACE inhibitor in those with a perceived contraindication. Of the patients on an ACE inhibitor, 90 (58%) were on 'full dose' or more (38% of all patients).

Table 3 shows the differences between specialties for the various attributes under consideration. Our focus is on the differences between cardiology and general medicine, as the number of patients looked after by geriatricians was very small, and the group described as 'other' was very heterogeneous. It is apparent from the data shown that cardiologists tried more patients on an ACE inhibitor (88% vs 71%,  $p < 0.01$ ), cardiologists conceded a contraindication less frequently (5% vs 18%,  $p < 0.01$ ) and cardiologists omitted consideration of an ACE inhibitor less often (6% vs 12%,  $p = \text{ns}$ ). It also follows that cardiologists 'succeeded' with an ACE inhibitor more frequently (88% vs 75%,  $p = \text{ns}$ ) because they conceded intolerance less frequently (12% vs 25%,  $p = \text{ns}$ ). The consequence is that cardiologists got their patients onto an ACE inhibitor more often (77% vs 53%,  $p < 0.01$ ) and onto an adequate dose more frequently (48% vs 31%,  $p < 0.05$ ).

**Table 1** Reasons for stopping an ACE inhibitor

Reason	Number of patients
Azotemia	10
Dizziness/hypotension	8
Cough	5
Non-compliance	2
Angioedema	1
Cramps	1
Headache	1

**Table 2** Reasons for not starting an ACE inhibitor

Reason	Number of patients
Renal impairment	6
Patient died first	6
Aortic stenosis	4
Probable mistake	3
Echocardiogram not believed	2
Delay	2
Diastolic heart failure	1

## Discussion

We have found that the majority of patients (66%) with heart failure confirmed by demonstration of moderate or severe left ventricular systolic dysfunction on echocardiography in a university teaching hospital were treated with an ACE inhibitor. This is higher than any previously reported series.<sup>16-18</sup> This is likely to reflect differences in study design, as ours is the first survey of this sort to focus on treatment of already investigated patients, rather than investigation and treatment of perhaps more heterogeneous patients.<sup>16-18</sup> It may also reflect the passage of time, and may provide evidence that the prescription of ACE inhibitors is increasing.<sup>17</sup> It is difficult to escape the conclusion, however, that it may also be because the centre studied is achieving better results than other centres (perhaps because so many patients were under a cardiologist).

We have found a significant minority of patients (12%) in whom an ACE inhibitor had been tried but had to be stopped because of adverse events or side-effects. Amongst these, renal dysfunction or symptomatic hypotension were much the most common reasons. Cough was surprisingly infrequent as a reason for stopping and other reasons were very infrequent indeed. This seems to be in line with previous work in this field.<sup>16-18</sup>

**Table 3** Differences between specialties

	Cardiology	General medicine	Geriatric medicine	Other
Number	151 (64%)	51 (22%)	8 (3%)	26 (11%)
Mean age (years)	66*	73	81	66
On ACE inhibitor	117 (77%)**	27 (53%)	4 (50%)	8 (31%)
On 'full-dose' ACE inhibitor	72 (48%)***	16 (31%)	0 (0%)	2 (25%)
Tried but failed ACE inhibitor	17 (11%)	9 (18%)	0 (0%)	2 (8%)
Never tried ACE inhibitor	17 (11%)**	15 (29%)	4 (50%)	16 (62%)
Never tried ACE inhibitor with reason	8 (5%)**	9 (18%)	2 (25%)	5 (19%)
Never tried ACE inhibitor with no reason	9 (6%)	6 (12%)	2 (25%)	11 (42%)
Symptomatic with heart failure	81 (62%)	22 (56%)	3 (50%)	8 (44%)
Died	21 (14%)	12 (24%)	2 (25%)	8 (31%)
Severe left ventricular systolic dysfunction	60 (40%)	24 (47%)	5 (63%)	12 (46%)

\* $p < 0.001$  vs general medicine; \*\* $p < 0.01$  vs general medicine; \*\*\* $p < 0.05$  vs general medicine.

We found as many patients again (10%) in whom an ACE inhibitor had never been tried because of a perceived contraindication or other problem. Amongst these, renal dysfunction and aortic valve disease were the most common reasons. There were also a number of patients who died before an ACE inhibitor could be started, either because they were so unwell with heart failure (eg, cardiogenic shock) or for some other reason (eg, cancer). There were also a small number of patients in whom an ACE inhibitor was not started because of a mistake, or a delay, or conflicting results.

Of rather more concern was that there were as many patients (12%) in whom an ACE inhibitor had never been tried despite the absence of any recognised contraindication. In many cases it was apparent that the finding of left ventricular systolic dysfunction was a somewhat incidental finding, and the focus of the patient's care clearly lay elsewhere, but that rather begs the question of why the echocardiogram was requested in the first place. This finding should certainly be a spur to greater vigilance in ensuring that such abnormal findings are always followed-up with appropriate investigation and treatment. It suggests that even in a university teaching hospital there are reserves of left ventricular systolic dysfunction which remain inadequately treated, even when adequately investigated.

It was somewhat surprising that such a majority of patients (64%) were looked after by cardiologists. In fact, three times as many patients were under the care of cardiologists as were under the care of general physicians. This is in marked contrast to previous reports.<sup>16-18</sup> Obviously this may reflect the bias inherent in our survey. It may not mean that cardiologists are looking after the majority of patients with heart failure, but simply that cardiologists are more likely to request echocardiography. This is probably true.<sup>19, 20</sup> It does not detract from the importance of our findings, however, which relate to the treatment of heart failure rather than its investigation. In fact, the importance of our findings may be compounded, if it means that inadequate investigation is followed up by inadequate treatment. We also found significant differences in treatment of patients by cardiologists and general physicians, in particular that cardiologists' patients were more frequently treated with an ACE inhibitor, less frequently never tried on an ACE inhibitor, and

### Learning points

- the benefits of ACE inhibitors in heart failure are indisputable
- despite this, a substantial minority of patients are not getting the treatment they need, even when adequately investigated in a 'centre of excellence'
- cardiologists do appear to have a better record in this respect, although they also appear to be looking after younger patients and (in this study) the majority of patients
- all medical staff have a responsibility to see that appropriate investigation is followed up by appropriate treatment

more frequently treated with 'full dose' ACE inhibitor. Obviously this may reflect differences in the patients rather than differences in practice, but it seems likely that it reflects both. For example, it can be seen that general medical patients were significantly older than cardiology patients. This is not unexpected. They may also have been more unwell, with worse renal function and more likely to be symptomatic from hypotension. This certainly could not account for the number of patients who were never tried on an ACE inhibitor despite the absence of even a perceived contraindication (also more amongst general medical patients than cardiology patients). The possibility that cardiologists are more likely to try their patients on an ACE inhibitor, and more likely to get them to stay on an ACE inhibitor at an adequate dose, remains.

If cardiologists really are more successful at getting their patients onto an ACE inhibitor the possible consequences are legion. As the effectiveness (and cost-effectiveness) of ACE inhibitors in the treatment of heart failure are indisputable, it suggests that cardiologists may be more effective (and cost-effective) at looking after patients with heart failure. It has already been suggested that cardiologists may be better for the treatment of unstable angina<sup>21</sup> and acute myocardial infarction.<sup>22</sup> This suggests that cardiologists may also be better for the treatment of heart failure.<sup>23</sup> The consequences of this for a cash-strapped but evidence-based health service need hardly be spelt out.

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