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Secondary prevention of coronary heart disease and heart failure in primary care

To the editor: We read with great interest the article by Khunti and colleagues reporting on a cluster randomised controlled trial evaluating a nurse-led disease management programme for secondary prevention of coronary heart disease and heart failure in primary care.[1] The authors should be commended for their large trial with 1316 patients from 20 primary care practices.

The authors described favourable results of the intervention for patients with coronary heart disease, however, for patients with confirmed diagnoses of left ventricular dysfunction the intervention in this trial was less effective than they had expected, with no improvement in treatment or quality of life. This study confirms the difficulty of finding an optimal model which it is feasible to implement in a primary care setting and at the same time is effective. The authors evaluated the effectiveness of their heart failure programme as improvement in prescribing an ACE inhibitor, confirmation of the diagnosis by echocardiogram and quality of life. Although the MAHLER study recently showed the importance of adherence to guidelines in heart failure,[2] one might wonder if the chosen outcomes in the study of Khunti *et al* were the best indices for evaluating optimal management of heart failure.

We recently published the COACH trial, in which we found that for the group receiving moderate or intensive education and counselling the time to admission to hospital was not decreased in comparison with a control group without education and counselling.[3] We even found a small, non-significant increase in hospital admissions. We discussed the possibility that because patients were being seen by nurses at an earlier stage this explained the increase in admissions to hospital and questioned whether admission to hospital is a good end point for evaluating heart failure disease management programmes, since timely admission to hospital is in itself likely to relieve symptoms and result in better diagnosis and management.[4]

To date the challenge is to find the best heart failure management programme in both primary and secondary care and at the same time find a realistic way to evaluate the cost-effectiveness of these programmes.

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REFERENCES

1. **Khunti K,** Stone M, Paul S, *et al*. Disease management programme for secondary prevention of coronary heart disease and heart failure in primary care: a cluster randomised controlled trial. *Heart* 2007;**93**:1398–405.
2. **Komajda M,** Lapuerta P, Hermans N, *et al*. Adherence to guidelines is a predictor of outcome in chronic heart failure: the MAHLER survey. *Eur Heart J* 2005;**26**:1653–9.
3. **Jaarsma T,** van der Wal MHL, Lesman-Leegte I, *et al*. Effect of moderate or intensive disease management program on outcome in patients with heart failure: Coordinating Study evaluating Outcomes of Advising and Counseling in Heart Failure (COACH). *Arch Intern Med* 2008;**168**:316–24.
4. **Cleland JG,** Coletta AP, Clark AL. Clinical trials update from the American College of Cardiology 2007: Alpha, Everest, Fusion Ii, Validd, Parr-2, Remodel, Spice, Courage, Coach, Remadhe, pro-BNP for the evaluation of dyspnoea and THIS-diet. *Eur J Heart Fail* 2007;**9**:740–5.

The authors' reply: We thank Dr Jaarsma for highlighting the importance of choosing appropriate outcomes in heart failure research. The COACH trial recently found that neither moderate nor intensive disease management programmes by a nurse specialising in management of patients with heart failure reduced death or hospitalisation compared with standard treatment.[1] In contrast, our trial evaluated the effectiveness of improvements in prescribing evidence-based treatments for heart failure and the appropriate assessment measured by echocardiography and quality of life.

There are major differences between the two trials. The COACH trial enrolled patients with heart failure after hospitalisation.[1] Most previously published studies of disease management programmes for patients with heart failure have recruited patients in a similar way.[2] Our trial was one of the first large intervention trials to recruit patients with both confirmed and presumed heart failure from the community. We chose our outcomes of process, intermediate outcomes of care and optimisation of diagnosis and medication management because despite the strong evidence base, patients are still inadequately diagnosed and managed in primary care[3] We also used an outcome of health-related quality of life as these are important outcomes for patients and they have been recognised as important clinical indicators which predict use of health services and mortality in people with chronic heart failure.[4]

Jaarsma mentions that the challenge is to find the best heart failure management programme in both primary and secondary care. However, we believe that different models of care and assessment of outcomes will be required for management of patients who have been discharged after hospitalisation than for those who are managed by primary care doctors. Jaarsma also highlights that the COACH trial used time to admission to hospital and then questions whether this is a good end point. This was illustrated in our cost-effectiveness study when the disease management programme seemed to lead to increased use of outpatient and inpatient services. We therefore agree that time to admission to hospital may not be a good end point if appropriate care can lead to referrals for hospitalisation.[5]

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REFERENCES

1. **Jaarsma T,** van der Wal MHL, Lesman-Leegte I, *et al*. Effect of moderate or intensive disease management program on outcome in patients with heart failure: Coordinating Study evaluating Outcomes of Advising and Counseling in Heart Failure (COACH). *Arch Intern Med* 2008;**168**:316–24.
2. **McAlister FA,** Lawson FME, Teo KK, *et al*. Randomised trials of secondary prevention programmes in coronary heart disease: systematic review. *BMJ* 2001;**323**:957–62.
3. **Strum H,** Haaijer-Ruskamp F, Veeger N, *et al*. The relevance of comorbidities for heart failure treatment in primary care: a European survey. *Eur J Heart Fail* 2006;**8**:31–7.
4. **Chin MH,** Goldman L. Gender differences in 1-year survival and quality of life among patients admitted with congestive heart failure. *Med Care* 1998;**36**:1033–46.
5. **Turner DA,** Paul S, Stone M, *et al*. Cost-effectiveness of a disease management programme for secondary prevention of coronary heart disease and heart failure in primary care. *Heart* Published Online First: 1 May 2008. doi:10.1136/hrt.2007.125708.

Care with single-coil automated implantable cardio-defibrillator leads

To the editor: Adamson and Nelson-Piercy give a thorough overview of arrhythmias in pregnancy.[1] However, they mention that the presence of an automated implantable cardio-defibrillator (AICD) poses no risk to the fetus as, even after device therapy, the electrical field to which the fetus is exposed is minimal.

We recently cared for a 23-year-old patient with hypertrophic cardiomyopathy who had an AICD implanted at the age of 14 with a single-coil lead and abdominal box. The box was therefore acting as an active can and any device therapy would involve a shock between the box and the single coil on the lead. During pregnancy the box came to lie directly over the uterus and any treatment would have resulted in a significant shock to the fetus. The AICD was disabled throughout pregnancy and the patient successfully delivered a healthy infant vaginally with no complications.

It is not uncommon for patients to have had single-coil defibrillator leads with abdominal generators implanted in childhood. The risks of device therapy to the fetus should be considered when these

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patients are assessed at cardiac pregnancy clinics.

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REFERENCE

1. **Adamson DL,** Nelson-Piercy C. Managing palpitations and arrhythmias during pregnancy. *Heart* 2007;**93**:1630–6.

Accuracy of real-time, three-dimensional Doppler echocardiography for stroke volume estimation compared with phase-encoded MRI: an in vivo study

To the editor: Accurate measurement of cardiac output (CO) is important in clinical medicine. Current methods of calculation use two-dimensional echocardiography and ventricle volumetry or spectral Doppler pulse wave. Phase-encoded MRI is an accurate technique for volume assessment; however, is not suitable for many clinical situations, such as in those who are critically ill.

Previous work by our group has shown that real-time, three-dimensional Doppler echocardiography (RT3DDE) can accurately compute stroke volume (SV) and CO in an animal model against a "gold standard" of aortic flow probe using the left ventricular outflow tract colour Doppler signal,[1] and this technique can be used in patients transthoracically.[2 3]

We tested the accuracy of RT3DDE of the left ventricular outflow tract for calculation of SV in a series of patients and healthy volunteers against a "gold standard" of phase-encoded MRI.

Two patients and 12 healthy volunteers took part in the study. The patients were undergoing MRI as part of their clinically indicated investigations for cardiac disease (both patients for aortic coarctation). All subjects gave written informed consent in accordance with the local Institutional Review Board.

The Philips Live 3D 7500 Sonos echocardiography system with a 3000-element 2–4 MHz xMATRIX transthoracic probe (Philips Medical Systems, Andover, Massachusetts, USA) was used for imaging. Subjects underwent echocardiography immediately before MRI.

Between three and five ECG-gated, three-dimensional colour Doppler volumes were acquired from each patient. With apical imaging and held gentle expiration, colour volumes contained the entire left ventricular outflow tract and the aortic valve. Colour gain was kept at 50% and the Nyquist limit maximised to ensure maximum frame rate. Depth was kept at the minimum necessary to see the aortic valve throughout the cardiac cycle. Colour Doppler volume acquisition requires seven alternate beats for capture, on a setting that ensures the whole cardiac cycle is captured.

MRI studies were performed on a 3 T scanner with an eight-element, phase-array cardiac coil (Philips Intera, Philips Medical Systems). Blood flow velocity measurements were carried out in the ascending aorta with the magnetic resonance phase-contrast technique for velocity encoding and a temporal resolution corresponding to the R-to-R duration, divided by 40 cardiac phases, with four averages to eliminate ghosting artefacts from breathing motion. The sequence parameters were: acquisition matrix: 176 (read-out) ×152 (phase-encodings), FOV 350–400 mm, TR/TE/flip 5.8/3.6 ms/10°, velocity encoding factor (VENC): 200 cm/s with retrospective ECG gating. No parallel-imaging speed-up—for example, by SENSE or a similar technique, was used for the phase-contrast measurements.

Phase-contrast images were analysed (Viewform, Philips Medical Systems) to determine the blood volume through the imaged cross section of the ascending aorta. Flow was calculated in ml/s, and systolic SV was obtained by numerical integration of the flow curves between the first phase, approximately 10–20 ms after the R wave, and the last systolic frame.

The RT3DDE volumes were analysed using commercially available software (TomTec Imaging Systems, Unterschleisshein, Germany). Analysis was as previously described[1 2] yielding the SV from the three-dimensional Doppler data.[4 5] In summary, the software uploads the RT3DDE volume in DICOM format. The retained Doppler data in the volume is used to calculate the flow volume over a Gaussian curve at the level of the aortic valve. A Gaussian curve is placed manually on the long-axis cuts of the volumes, at the level of the valve and a region of interest is traced around the colour data in the left ventricular outflow tract. The software then calculates the flow–time curve by integration of the retained Doppler velocities within the area of interest, at the level of the sampling curve, over the cardiac cycle. In the absence

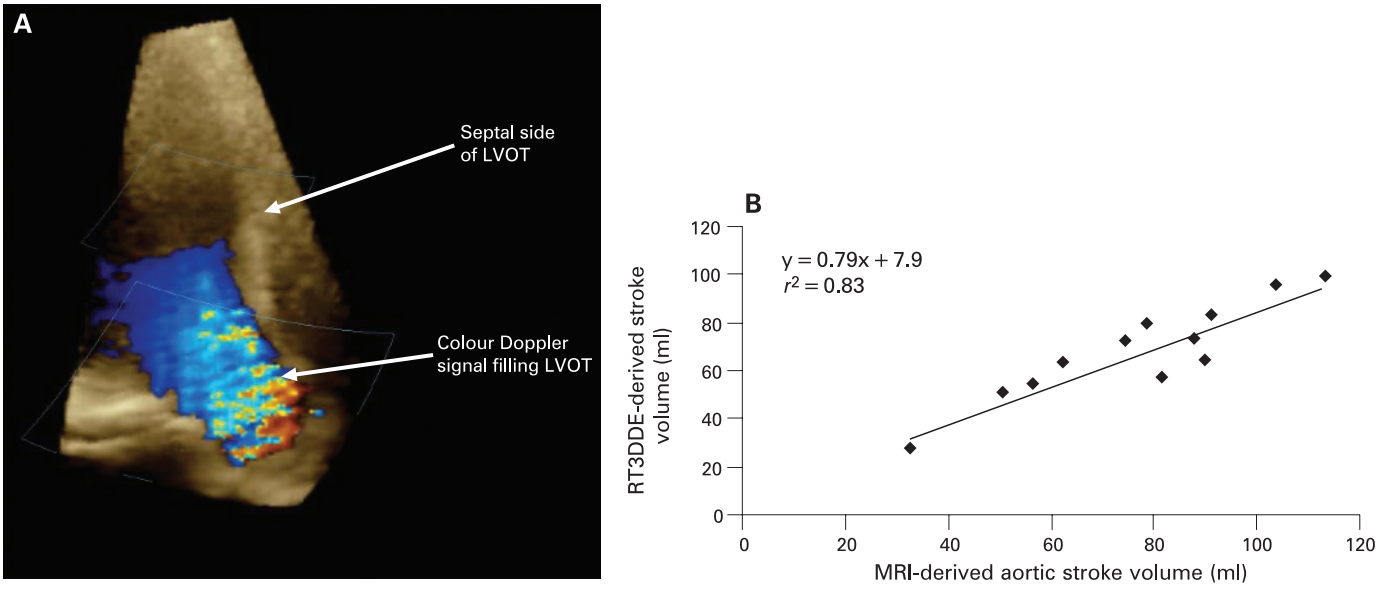

Figure 1 (A) A long-axis slice of the cylinder of flow signal from the three-dimensional left ventricular outflow tract (LVOT) flow image. (B) Correlation between the three-dimensional Doppler echocardiography (RT3DDE) method and the "gold standard" phase-encoded MRI method of stroke volume calculation showing excellent agreement between the two methods.

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of aortic regurgitation, this aortic forward flow should equate to the SV.

Results are expressed as mean (SD). Linear regression analysis was used to obtain correlation coefficient between the RT3DDE data and the phase-encoded MRI data. Interobserver variability in the RT3DDE calculations was tested by analysis of 15 datasets by a second operator (XL) who was blinded to the results of the first operator and the phase-encoded MRI results.

RT3DDE quality was poor in two volunteers and analysis was not possible from these datasets. Ages ranged from 9 to 51, mean (SD) 29.25 (12.24). Both patients undergoing MRI for possible aortic coarctation had minor coarctations with no other abnormalities. All volunteers had normal echoes. All were in sinus rhythm for the study. There was no significant difference in baseline haemodynamics during RT3DDE or MRI: mean (SD) heart rate during RT3DDE –63.98 (6.63) bpm, and 63.75 (10.24) bpm during MRI.

A total of 65 individual RT3DDE loops were taken from the other 12 studies. There was excellent correlation between these two methods of SV calculation: $y = 0.79x + 7.9$, $r^2 = 0.83$ (fig 1). The level of agreement between the two methods shows a mean (SD) difference of 5.7 (8.75) ml with RT3DDE underestimating SV compared with the reference of phase-encoded MRI. Interobserver variability was tested in 15 RT3DDE loops with good correlation between the results of the two observers ($y = 1.05x–3.76$, $r^2 = 0.93$, mean (SD) difference 0.27 (7.93) ml).

RT3DDE has previously been used to assess ventricular volumes and ventricular mass very accurately against a "gold standard" of MRI.[4] This study shows that the Doppler data retained in RT3DDE volumes can be used to calculate SV against a "gold standard" of phase-encoded MRI-derived SV. RT3DDE overcomes the limitations of two-dimensional echocardiography as geometric assumptions do not have to be made. It is non-invasive so has advantages over thermodilution methods of SV calculation, especially in paediatric patients. These results are in agreement with previous work showing that RT3DDE can be used to assess intracardiac flow volumes both in vitro and in vivo.[1–3]

There are several limitations to this study. The study group and range of CO are small, yet despite this, there is good agreement between the two methods of volume calculation. Poor three-dimensional images result in less than optimal three-dimensional colour Doppler data and therefore poor volume estimation. Sinus rhythm is required and arrhythmias can produce R–R mismatch. As acquisition takes only seven alternate beats, breath holding is not a problem in cooperative patients. This could be a problem in smaller infants with rapid respiration. RT3DDE is not truly "real-time" as the volume is acquired over seven alternate gated cycles. Analysis is also offline.

RT3DDE slightly underestimated the SV compared with the phase-encoded MRI standard. This could be owing to a number of factors, including the image quality and depth. All had good three-dimensional echo images. Our previous work showed that at depths greater than 14 cm, the image quality is reduced and volume calculation is less accurate.[5] In this study none of the images were at depths greater than 13 cm. The depth is linked to the frame rate and frame rates over 12 are required for accurate SV calculation.

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Heart 2008;**94**:1212–1213. doi:10.1136/hrt.2008.147751

REFERENCES

1. **Pemberton J,** Li X, Karamlou T, *et al*. The use of live three-dimensional Doppler echocardiography in the measurement of cardiac output: an in vivo animal study. *J Am Coll Cardiol* 2005;**45**:433–8.
2. **Pemberton J,** Li X, Kenny A, *et al*. Real-time 3-dimensional Doppler echocardiography for the assessment of stroke volume: an in vivo human study compared with standard 2-dimensional echocardiography. *J Am Soc Echocardiogr* 2005;**18**:1030–6.
3. **Ge S,** Bu L, Zhang H, *et al*. A real-time 3-dimensional digital Doppler method for measurement of flow rate and volume through mitral valve in children: a validation study compared with magnetic resonance imaging. *J Am Soc Echocardiogr* 2005;**18**:1–7.
4. **Mor-Avi V,** Sugeng L, Weinert L, *et al*. Fast measurement of left ventricular mass with real-time three-dimensional echocardiography. *Circulation* 2004;**110**:1814–8.
5. **Pemberton J,** Hui L, Young M, *et al*. The accuracy of three-dimensional color Doppler derived flow volumes with increasing image depth. *J Ultrasound Med* 2005;**24**:1119–25.

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