

for patients undergoing lung cancer screening or follow-up for interstitial lung disease.

Methods Computerised Radiology Information Service (CRIS) was manually searched to determine all HRCT scans performed in our Trust from 01/05/2015 to 01/05/2016. The reports issued by Radiologists and images of selected studies were reviewed.

Results 2152 HRCT scans were performed over this period. Patients were divided into three groups of age <50 (Group 1); 50-<60 (Group 2) and 60 (Group 3). 100 scans were randomly selected from each group using a random number generator to give a total of 300 patients. The mean ages of patients in Group 1, 2 and 3 were 42.7 ± 2.3 , 57.4 ± 1.4 and 66 ± 2.7 respectively. There was, approximately, the same number of males as females in each group. CAC was seen in 10% of scans in Group 1, 85% of scans in Group 2 and 92% in Group 3. CAC was only reported in 2/10 (20%) of scans in Group 1, 39/85 (45.9%) in Group 2 and 41/92 (44.6%) in Group 3. No scan commented on the absence of calcification. For the positive reports Agatston scores were not calculated and CAC was perceptually graded a mild, moderate or severe. SS and PJ independently calculated the Agatston scores of HRCT scans whose reports did not comment on the degree of calcification (105/187). We excluded 15/105 (14.3%) scans as they were uninterpretable due to motion artefacts. Of the remaining 90 scans analysed 63/90 (70%) had severe CAC with an Agatston score of >400 with the remaining showing moderate calcification (101–400). Cohen $\hat{\kappa}$ agreement between the two authors rating was 0.88 (95% confidence interval [CI] 0.82–0.94). Group 2 and 3 had significantly more patients with severe CAC than group 1 ($p<0.001$). Left anterior descending artery was most commonly affected.

Conclusion This study shows that CAC is under reported on non-gated HRCT scans. Given that respiratory disease is an independent risk factor for developing cardiac disease, we believe that CAC must be reported on patients having imaging for respiratory conditions. By mentioning the degree of CAC as a standard when reporting non-gated HRCT scans, we can risk-stratify patients and refer them to cardiologists for further investigations, such as stress-echo and commence them on medications for primary prevention of cardiovascular disease. The images of calcified coronary arteries may also potentially have a role in convincing people to make correct lifestyle choices.

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APPLYING APPROPRIATE USE CRITERIA FOR TRANSTHORACIC ECHOCARDIOGRAPHY TO CLINICAL PRACTICE

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10.1136/heartjnl-2017-311726.117

Introduction Transthoracic echocardiography (TTE) is a well-established, non-invasive method of investigating multiple pathologies in cardiology and is widely accessible to non-cardiologists. Appropriateness use criteria (AUC) have been developed by the American College of Cardiology Foundation (ACCF), but these are not implemented systematically in everyday practice. Previous studies indicate that approximately 1 in 10 requests may be avoidable. In our hospital the cardiorespiratory department performs over 10,000 TTEs per year. While most requests for TTE are appropriate, a small number of

inappropriate requests amounts to an avoidable burden in the workload of department.

Purpose To determine how many inappropriate requests were received by the department and if there were any patterns to the inappropriate requests that would inform the development of screening questions when moving from a paper based to electronic requesting system.

Methods All inpatient and outpatient requests were collected and analysed over 12 consecutive days in January 2015. The system for requesting TTEs was paper based with free text boxes. Requests from primary care were excluded as they had fixed criteria for requesting TTEs. All requests were assigned to the most closely applicable indication and appropriateness score based on the ACCF 2011 criteria. The requesting system was then changed to an electronic system with mandatory screening questions based on the AUC. All inpatient and outpatient requests were again collected over 14 consecutive days, in August/September 2016, once the electronic system was established. Requests were analysed using the same criteria.

Results We analysed 294 requests, 2.4 outpatient requests for each inpatient request, in 2015 and 333 requests, 1.85 outpatient requests for each inpatient request, in 2016. Approximately half of requests came from cardiology services, 47% in 2015 and 52% in 2016. The commonest indications were similar both years, with ACCF indications 1 and 2; symptoms (e.g. chest pain, palpitations, dyspnoea, etc.) or test results suggesting cardiac pathology (e.g. abnormal ECG, elevated cardiac biomarkers, etc.) accounting for 22% of requests in 2015 and 34% in 2016.

In 2015, 91% (n=266) of requests were appropriate, 5% (n=16) of uncertain appropriateness and 4% were inappropriate (n=12). After implementation of the screening questions through electronic requesting, inappropriate requests had reduced to 1% (n=4) of total requests, 2% (n=5) were of uncertain appropriateness and 97% (n=324) were appropriate ($p=0.0477$). This equated to an estimated reduction of eight inappropriate or uncertain requests a week.

Conclusion After implementation of screening questions in an electronic requesting system, inappropriate requests fell. Systematic screening of TTE requests can help to reduce inappropriate requests and allow resources to be focused on appropriate indications.

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V/Q SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY IN NON-THROMBOEMBOLIC PULMONARY ARTERIAL HYPERTENSION

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10.1136/heartjnl-2017-311726.118

Background Pulmonary arterial hypertension (PAH) is a rare cause of pulmonary hypertension (PH) with poor prognosis. Current guidelines recommend ventilation/perfusion (V/Q) scan in screening for thromboembolic cases of PH. We hypothesise that perfusion defects in non-thromboembolic PAH could also render abnormal V/Q scans, and sought to evaluate the incidence and clinical significance of abnormal V/Q SPECT in patients without thromboembolism.

Methods A total of 136 patients underwent V/Q SPECT (single-photon emission computed tomography) and right heart

catheterization in our national PH service during 2013–2015 and were diagnosed with PH with mean pulmonary arterial pressure (mPAP) 25mmHg. V/Q mismatch suggesting thromboembolism was assessed according to European Association of Nuclear Medicine guideline. V/Q SPECT scans were further classified according to the pattern of perfusion defect, with focal defects typical for localised thromboembolism, and global perfusion defects. The results were compared with thromboembolism detected by computed tomography (CT) and invasive pulmonary angiography. All-cause mortality was recorded for a median follow-up of 1 year.

Results Abnormal V/Q SPECT with normal pulmonary angiography was found in 19 patients, and majority (78.9%) of these patients had PAH. After re-defining V/Q SPECT images according to the pattern of perfusion defects, compared to patients with focal perfusion defects or normal scans, those with global perfusion defects had higher mPAP ($\beta^2=7.55$, 95% CI 2.85–12.3, $p=0.002$) and pulmonary vascular resistance ($\beta^2=195.4$, 95% CI 59.3–331.5, $p=0.006$). Among patients with PAH, global perfusion defects were associated with higher all-cause mortality with hazard ratio 5.63 (95% CI 1.11–28.5) compared to those with local or no perfusion abnormalities.

Conclusions There is a high incidence of abnormal V/Q SPECT scans in non-thromboembolic PAH. An abnormal V/Q SPECT in the context of PAH is associated with a worse outcome.

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ECHOCARDIOGRAPHIC VERSUS CARDIAC CATHETERISATION DERIVED MEASURES OF RIGHT HEART PRESSURES: A RETROSPECTIVE ANALYSIS FROM THE UNIVERSITY HOSPITALS OF NORTH MIDLANDS

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10.1136/heartjnl-2017-311726.119

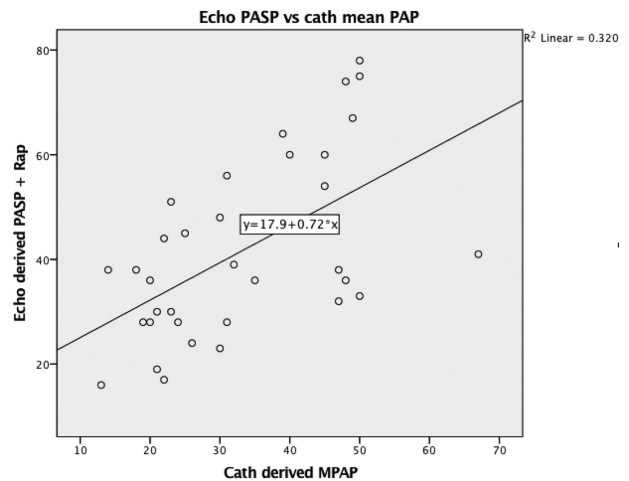
Introduction Assessment for pulmonary arterial hypertension (PAH) is a common indication for transthoracic echocardiogram (TTE). PAH is defined as a mean pulmonary artery pressure (PAP)>25 mmHg and is associated with reduced quality of life, increased mortality and morbidity. TTE is the major technique for screening and serial assessment. The general consensus amongst cardiologists at this unit is that there is poor agreement between reported echo values and invasively derived measures at right heart catheter (RHC). The primary aim of this study was to complete a retrospective analysis directly comparing TTE estimation of right heart pressures with those measured invasively at RHC for:

1. Pulmonary artery systolic pressure (PASPP)
2. Mean pulmonary artery pressure (MPAP)
3. Right atrial pressure (RAP)

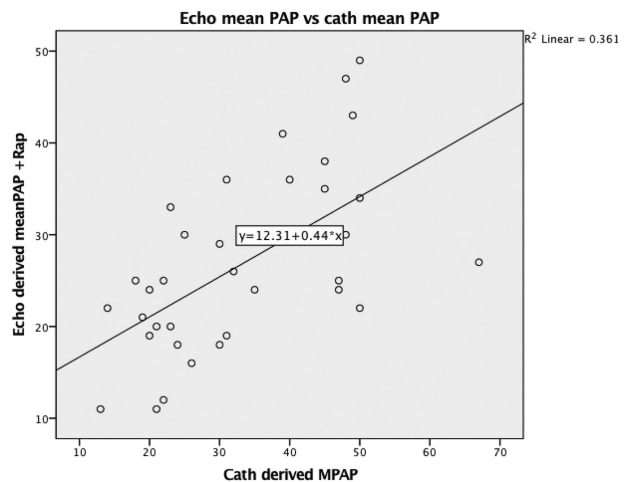
4. Other echocardiographic features of pulmonary hypertension and the presence of raised pulmonary pressures on RHC
Method Data was collected from patients attending for RHC between 01/01/2015 and 30/09/2016, who had both RHC and TTE within 3 months.

Age, height and weight were recorded.

Invasive and echo derived measurements were re-analysed by a senior, BSE accredited cardiac physiologist for **PASP** ($4\sqrt{V_A, \dot{A}^2} + Rap$), **MPAP** ($0.61 * PASP+2$), **RAP** (IVC:



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<2.1 cm with normal respiratory variation $Rap=5$ mmHg, IVC>2.1 cm with <50% respiratory variation $Rap=15$ mmHg) and other echo features of PHTN: RV Size, RV function and presence of septal flattening.

Results 150 patients were listed for RHC, 34 (22%) also had TTE within 3 months. There were 16 male and 18 female subjects with a mean age 66 years.

21 (62%) patients had PHTN, diagnosed by $MPAP>25$ mmHg on cardiac catheter. Of those, echo subdivision showed 38% had mild (25–40 mmHg), 19% moderate (41–55 mmHg) and 43% severe (>55 mmHg) PHTN.

Invasive measurements were compared to the original echo report: 50% of patients with mild PHTN, 75% of patients with mod PHTN and 88% of patients with severe PHTN had other echocardiographic features associated with pulmonary hypertension.

There was no correlation between invasive and echo assessment or right atrial pressure (R^2 0.003; Pearson Correlation 0.052, $p=0.78$).

There was good correlation between RHC derived mean PAP and both echo mean PAP (R^2 0.36; Pearson Correlation 0.60, $p<0.01$) and PASP (R^2 0.32; Pearson Correlation 0.56, $p<0.01$).