urgent radiology referrals rather than all being allocated to TWR appointments amenable to direct GP bookings. More work is needed to develop this referral pathway further.

P231 "SAFETY-NET" FOR ABNORMAL CHEST RADIOGRAPHS WITH A LOW INDEX OF SUSPICION FOR MALIGNANCY

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Introduction and Objectives Guidelines dictate that where a chest x-ray is incidentally suggestive of lung cancer, a copy of the radiologists report is sent to a designated member of the lung cancer multidisciplinary team. A similar system was implemented for abnormal chest radiographs demonstrating significant non-malignant changes or abnormalities with a low index of suspicion of malignancy. This was used to assess if abnormal chest radiographs are adequately followed-up by the requesting clinicians.
Methods Reporting radiologists coded radiographs that warranted further action such as repeat imaging within a specified time frame. These were relayed to a designated coordinator. If action did not occur as suggested on the report, the requesting clinician was prompted on a weekly basis until the issue was resolved or else referred to a member of the chest team for further evaluation. At 6 months the cases were reviewed and information extracted including indication for further action, whether action occurred without coordinator intervention and outcome.
Results All coded films over a 6-month period (n=331) were analysed. The most frequent indications for further action included the assessment of pneumonia resolution (n=167), further review of possible hilar pathology (n=25), small nodules (n=22) and other unexplained abnormalities. 143 cases (42.6%) required action by the coordinator. In total, 4% (n=13) of cases yielded significant diagnoses including eight malignancies, pulmonary embolism, cobalt induced fibrosis and asbestosis, of these one case required action by the coordinator.
Conclusions This study suggests that a large proportion of abnormal chest radiographs are not followed-up as suggested by the reporting radiologist. Significant diagnoses may therefore be delayed unnecessarily. There is little reason to assume that similar practice is uncommon throughout the country. While the number of significant diagnoses detected by the "safety-net" system was perhaps lower than expected, some may consider a delay in 7.7% (1/13) unacceptably high. Further exploration of this area is needed to decide whether this is an effective use of resources.

P232 SHORT-TERM OUTCOMES IN HEART FAILURE PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN THE COMMUNITY

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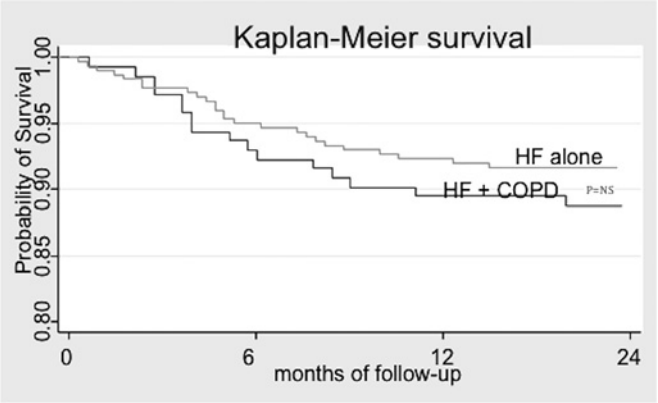
Aims Heart failure (HF) and chronic obstructive pulmonary disease (COPD) are common co-morbidities. The combination presents diagnostic challenges and has been linked with worse prognosis in patients admitted to hospital. There is hardly any prognostic data in patients with both co-morbidities in the community.
Methods and Results We evaluated 783 patients (27.2%) with left ventricular systolic dysfunction under the care of a regional nurse-led community HF team between June 2007 and June 2010. 101 patients (12.9%) also had a diagnosis of COPD. 94% of patients were on loop diuretics; 83% on ACE inhibitors, 74% on β-blockers; 10.6% were on bronchodilators and 42% on aldosterone antagonists. Mean age of the patients was 77.9±5.7 years; 43% were females and mean NYHA class was 2.3±0.6. Mean follow-up was 28.2±2.9 months. β-Blocker utilisation was markedly lower in patients receiving bronchodilators compared to those without (overall 21.7% vs 81%; p<0.001). 24-month survival (Abstract P232 figure 1) was 93% in patients with HF alone and 89% in those with both co-morbidities (p=NS). The presence of COPD was associated with increased HF hospitalisations [HR 1.56 (1.4 to 2.1); p<0.001] and major adverse cardiovascular events [HR 1.23 (1.03 to 1.75); p<0.001].



Abstract P232 Figure 1 Kaplan—Meier survival curve in patients with heart failure, comparing those with and without chronic obstructive pulmonary disease for June 2007 to June 2010.

Conclusions COPD is a common co-morbidity in ambulatory HF patients in the community and is a powerful predictor of worsening HF. It does not however appear to affect short-term mortality in ambulatory HF patients.

P233 JUDICIOUS USE OF OXIMETRY CAN HELP DELIVER COST EFFECTIVE SLEEP SERVICE

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Background Referrals to sleep service are increasing rapidly and make up to 30% of referrals to the Queen's Medical Centre campus of Nottingham Respiratory Department. Limited channel polysomnography (PSG) at home (PSH-H) or video (PSG_V) are time consuming and costly. In a retrospective study we assessed the role of oximetry in delivering cost effective sleep service.
Methods We reviewed new referrals to sleep clinic during February and March 2011. We aimed to quantify referrals, assess what investigations were done, the results of these and subsequent management. Cost analysis was then performed to assess impact of the tests ordered on service delivery. Costs of various tests at our centre are: oximetry £28, PSG-H—£ 200 and PSG-V—£350.
Results In February and March this year 79 new referrals were identified for snoring or sleep disturbance. 53 patients (67%) had oximetry as first test and 26 (33%) had PSG-H or PSG limited or video PSG. The two groups had similar baseline characteristics with BMI of and Epworth Sleepiness Scale (ESS) score of 11. Of those who initially had oximetry 15 (29%) went on to have PSG. Thus 52% of all referrals had PSG whereas 48% were managed with oximetry only. There was statistically significant correlation between 4% oxygen desaturation index per hour (4% ODI) and apnoea-hypopnoea index (AHI) obtained from PSG (R=0.96; p=0.05). The type of diagnostic test used had no impact on CPAP use. We see 600 new referrals per year. Had all patients been subjected to PSG it would cost the service

£120 000 to £210 000 depending on the type of polysomnography requested. With nearly 50% patients managed with oximetry it would cost £68 400 to £113 000 leading to huge cost saving without compromising on the quality of service.

Conclusion Judicious use of oximetry can help deliver cost effective sleep service.

Improving delivery of care in cystic fibrosis

P234 THE IMPORTANCE OF APPROPRIATE REFERENCE EQUATIONS FOR SPIROMETRY: LESSONS LEARNED FROM THE CYSTIC FIBROSIS GENE THERAPY "RUN-IN" STUDY

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Introduction and Objectives The "Run-In" study is an on-going longitudinal, observational study of CF patients assessing outcome measures for a future gene therapy trial. Spirometry is performed at each visit and volumes are converted to % predicted values according to published reference equations; historically these were separate for adults and children. Here, we describe the issues arising from this approach, and highlight the benefit of using a reference source which bridges the transition from child to adulthood.

Methods CF subjects (=10 years; FEV_1=40% predicted) were recruited from three sites in London and Edinburgh. Visits were undertaken during periods of stability every 3–6 months; data presented here are from the first four visits. Spirometry was performed on an Easyone spirometer. Volumes were converted to % predicted values according to Rosenthal (<18 years) and Quanjer (=18 years) reference equations. The FEV_1 raw data were subsequently re-analysed using Stanojevic reference equations, which span all age ranges. Comparisons were made using paired t-tests.

Results 191 patients attended visit 1 (mean age 22.7 years, 55% male; 91 patients <18 years). Rosenthal and Quanjer FEV_1% predicted values were significantly higher than the Stanojevic values: mean differences 2.8 (95% CI 1.9 to 3.7) for children with Rosenthal equations ($p<0.0001$), and 2.4 (95% CI 2.1 to 2.8) for adults using Quanjer equations ($p<0.0001$). 10 patients transitioned between paediatric and adult reference ranges during the study period; the slope of change in their FEV_1% over visits 1–4 was significantly greater with Rosenthal/Quanjer references than with Stanojevic ($p=0.001$) largely due to an artefactual drop when switching from Rosenthal to Quanjer values. As an example, a female patient aged 17.8 years at visit 1 had a drop in absolute FEV_1% predicted between visits 1 and 2 of 11% when Rosenthal/Quanjer were used but only 3% with Stanojevic reference values.

Conclusions Our results highlight issues raised when separate adult and paediatric spirometry reference ranges are used in longitudinal study. The UK CF Gene Therapy Consortium has adopted the Stanojevic reference source for all spirometry analysis in its ongoing Clinical Programme.

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P235 A UK REGISTRY STUDY OF PROPHYLACTIC ANTIBIOTIC USE FOR *STAPHYLOCOCCUS AUREUS* IN CHILDREN WITH CYSTIC FIBROSIS

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Background The UK antibiotic guidelines for cystic fibrosis (CF) recommend that all infants should be prescribed a prophylactic narrow spectrum antibiotic, such as flucloxacillin, from diagnosis until 3 years of age. We wished to evaluate the prevalence of prophylactic antibiotic use in the UK and the effect this had on the microbiological outcome of children with CF.

Methods A registry search was conducted on the UK CF registry to include all children <3 years at the time of the 2009 dataset (UK CF registry. Cystic Fibrosis Trust, 2011). Information on antibiotic prophylaxis ("chronicoral antibiotic not prescribed to treat an exacerbation") and bacterial status (no growth, intermittent or chronic) are entered at the time of annual assessment and refer to the previous year.

Results We identified 609 children who were born between August 2006 and December 2009, for whom data were available. Of these, 480 children (78.8%) were on prophylaxis and, 385 (80.2%) were on flucloxacillin alone. Prevalence of chronic/intermittent *Staphylococcus aureus* and *Pseudomonas aeruginosa* were similar between those not on antibiotics to those on flucloxacillin only. The use of "other" antibiotics was significantly associated with an increased prevalence of *P aeruginosa* ($p=0.005$, Bonferroni corrected threshold=0.0125).

Conclusions Despite current recommendations a sizeable minority of children with CF are not on anti-*Staphylococcal* prophylaxis. Of those who are, the majority receive flucloxacillin. Given the limited dataset, we did not detect any significant differences in microbiological outcome between those on regular Flucloxacillin to those on no antibiotics. Of note, the prevalence of *S aureus* in the under three group is around 7% compared with the overall UK prevalence of 15.2%. Prophylactic use of antibiotics other than Flucloxacillin (mostly cephalosporins; n=36 out of 95) appear associated with increased prevalence of *P aeruginosa*. This is consistent with findings from a previous US study implicating cephalosporin prophylaxis in acquisition of infection with *P aeruginosa* (*J Pediatr* 2002;**140**:299–305). Randomised controlled trials with long term follow-up, using clinically relevant outcomes, are warranted in order to better understand the effect antistaphylococcal prophylaxis has on the progression of CF lung disease.

Abstract P235 Table 1

	Not on antibiotics	On regular flucloxacillin	On other (inc. combinations)	Total
Chronic/intermittent *S aureus* positive	10 (7.75%)	29 (7.53%)	5 (5.26%)	44
Chronic/intermittent *P aeruginosa* positive	20 (15.50%)	61 (15.84%)	31 (32.63%)	112
Chronic/intermittent *S aureus* and *P aeruginosa* positive	6 (4.65%)	23 (5.97%)	3 (3.16%)	32
No positive cultures	93 (72.09%)	272 (70.65%)	56 (58.95%)	421
Total	129	385	95	609

P236 CYSTIC FIBROSIS DEATHS IN USA AND UK: COMPARISONS OF REGISTRY AND ROUTINE DATA

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Background MDT care in dedicated centres has been a contributor to improved Cystic Fibrosis (CF) survival and in UK and USA outcomes for patients in centres, and is collected by national CF registries. Routine national death data using ICD-10 codes will identify all CF deaths giving an indication of how many deaths occur in patients not receiving centre care. It might be suspected that the UK health service with universal access might have a

However, a potential important confounding factor may explain a part of their results: undiagnosed pulmonary embolism (PE), mimicking (or induced by) COPD exacerbation. Troponin and BNP are factors associated with poor prognosis in PE.[2] COPD is associated with an increased risk of deep venous thrombosis and PE (particularly during exacerbation) and with an increased risk of fatal PE.[3] In particular, COPD is associated with increased risk of death from undiagnosed PE.[4]

The real incidence of PE during exacerbation of COPD is not clearly known, ranging from 1.5% to 24.7%[5] corresponding to the incidence of elevated troponin and BNP, as noted by Chang *et al* in their cohort. Therefore, it would be of great interest if Chang *et al* could provide us some precise answers:

- In how many of the 250 patients a PE has been evoked and/or eliminated?
- How many patients were under efficient anticoagulant drugs at inclusion?
- How many patients received thromboprophylaxis, as a significant number of patients included presented other PE risk factors such as malignancy or cerebrovascular diseases?

Because of reserved prognosis of COPD patients with PE, and of the availability of preventive and curative specific drugs, COPD patients admitted with exacerbation and with abnormal cardiac biomarkers may require a PE screening and effective thromboprophylaxis if PE has been ruled out.

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REFERENCES

1. **Chang CL,** Robinson SC, Mills GD, *et al*. Biochemical markers of cardiac dysfunction predict mortality in acute exacerbations of COPD. *Thorax* 2011;**66**:764–8.
2. **Lega JC,** Lacasse Y, Lakhal L, *et al*. Natriuretic peptides and troponins in pulmonary embolism: a meta-analysis. *Thorax* 2009;**64**:869–75.
3. **Laporte S,** Mismetti P, Décousus H, *et al*. Clinical predictors for fatal pulmonary embolism in 15,520 patients with venous thromboembolism: findings from the Registro Informatizado de la Enfermedad TromboEmbolica venosa (RIETE) Registry. *Circulation* 2008;**117**:1711–16.
4. **Pineda LA,** Hathwar VS, Grant BJ. Clinical suspicion of fatal pulmonary embolism. *Chest* 2001;**120**:791–5.
5. **Rizkallah J,** Man SF, Sin DD. Prevalence of pulmonary embolism in acute exacerbations of COPD: a systematic review and meta-analysis. *Chest* 2009;**135**:786–93.

Authors' response

We thank Bertoletti and colleagues for raising the important issue of pulmonary embolism (PE) in the exacerbation of chronic obstructive pulmonary disease (COPD).[1] Although we did not routinely investigate for PE in our cohort, we excluded any patients with suspected or confirmed PE from the study.[2] Unfortunately, it is difficult to detect thromboembolic events in this population and it is possible that we included some patients with subclinical pulmonary emboli. It is also plausible that this contributed to the association between elevated cardiac biomarkers and mortality. However, we think that this is unlikely to be the only mechanism.

Thromboprophylaxis was administered to some patients during their admission depending on their immobility and other risk factors, but this would not have influenced the NT-proBNP or troponin T results obtained on presentation. We did not collect information on pre-existing anticoagulation therapy on admission to the study.

Further research into the mechanism linking elevated cardiac biomarkers and mortality in COPD exacerbation is needed. We agree with Bertoletti and colleagues that investigating the contribution of concurrent PE is important, as this is something that can be treated.

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REFERENCES

1. **Bertoletti L,** Mismetti P, Decousus H. The cloud of pulmonary embolism during COPD exacerbation. *Thorax* 2012;**67**:178.
2. **Chang CL,** Robinson SC, Mills GD, *et al*. Biochemical markers of cardiac dysfunction predict mortality in acute exacerbations of COPD. *Thorax* 2011;**66**:764–8.

CORRECTIONS

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Thorax 2011;**66**:A128–A129 doi:10.1136/thoraxjnl-2011-201054c.151. P151 Cost of pulmonary rehabilitation is offset by reduction in healthcare utilisation. The author list and author affiliations for this poster should read: [1] S Kibe, [1] D Ford, [2] S Hart. 1 Scarborough General Hospital, Scarborough, UK; 2 Castle Hill Hospital, Hull, UK.

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Thorax 2011;**66**:A133–A134 doi:10.1136/thoraxjnl-2011-201054c.163. P163 Factors influencing histological confirmation of diagnosis in lung cancer patients. The author list for this poster should read: S Chandramouli, M Cheema, J Corless. Wirral Lung Unit, Arrowe Park Hospital, Wirral CH49 5PE, UK.

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Thorax 2011;**66**:A162–A163 doi:10.1136/thoraxjnl-2011-201054c.233. P233 Judicious use of oximetry can help deliver cost effective sleep service. The author list and affiliation for this poster should read: C L Collins, B Balakrishnan, J Madieros, M Sovani. Queen's Medical Centre, Nottingham University Hospitals, Nottingham, UK.

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Thorax 2011;**66**:A140 doi:10.1136/thoraxjnl-2011-201054c.179. P179 The changing numbers and indications of mediastinoscopy procedures performed following the introduction of endobronchical ultrasound at a UK tertiary centre. The author list and affiliations for this poster should read: [1]M Bakir, [2]R Breen, [2]A Quinn, [2]J King, [1]G Santis. 1 Kings College London, London, UK; 2 Guy's and St Thomas' NHS Foundation Trust, London, UK.