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**Aims and objectives:** To evaluate the indices of quality of life after PE depending on sex and age and to determine their dynamics under the influence of warfarin.

**Methods:** Assessment of indices of quality of life was done in 80 patients who had survived PE during their hospital stay and out-patient treatment using the questionnaire MOS SF-36.

**Results:** Patients of both sexes taking warfarin after PE showed better indices of physical status (PhS), psychic status (PsS), general status (GS) during out-patient treatment than during their hospital stay. Females had lower indices of quality of life than males both on the in-patient and out-patient stages of treatment.

Patients of both age groups (45-60 years and over 60) taking warfarin after PE demonstrated significantly higher indices of PhS, PsS and GS than those who did not take warfarin.

Indices of general health of patients taking warfarin after PE were significantly better ( $39.5 \pm 9.5$ ) than those in patients who received no anticoagulant therapy ( $25.3 \pm 5.9$ ),  $p < 0.05$ .

**Conclusions:** Administration of warfarin in the dose of 3-5mg in complex program of therapeutic and prophylactic measures leads to significant increase of absolute values of life quality parameters in accordance with physical and psychic statuses as well as general health being an objective sign of level of adaptation of a person to living conditions in society.

### P3878

#### Thrombophilias in 60 Bulgarian patients with "idiopathic" venous thromboembolism

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In the last two decades, many inherited and acquired thrombophilias predisposing venous thromboembolism (VTE) became known. The aim of this real life study is to analyze the frequencies of some thrombophilias in patients with acute VTE, in whom no underlying diseases or triggering-VTE factors are present ("idiopathic"). 60 ethnic Bulgarians (34 men and 26 women, mean age 34.47) with VTE (39 with deep vein thrombosis (DVT) only, 12 with pulmonary embolism (PE) only and 9 with both) were examined for: Leiden mutation (FVL), prothrombin factor II mutation (G20210A), plasminogen activator inhibitor-1 mutation (PAI-1), C677T and A1298C of methylenetetrahydrofolate reductase (MTHFR) mutations; deficiency of protein C (pr.C), deficiency of protein S (pr.S), deficiency of antithrombin III (AT III) and antiphospholipid antibodies syndrome (APLS).

In 48 (80%) of patients (79.48% in DVT, 80.95% in PE patients) were found in total 79 abnormalities. FVL heterogeneous mutation was found in 15 (25% of all patients) and homogeneous in 2 (3.3%) patients. FVL represents 21.51% of all found abnormalities. PAI-1 was found in 17 patients and represents 21.51% of all abnormalities. 11 (18.3%) were homogeneous and 6 (10%) were heterogeneous in combination with other abnormalities. 6 (10%) had G20210A mutation and 14 (23%) - deficiency of AT III. We also found deficiency of Pr.S in 6, Pr.C in 3; mutations C677T in 4, A1298 in 7 patients. APLS was found in 5 patients.

We conclude that most of the patients with "idiopathic" VTE have one or more thrombophilias. In addition to the known role of FVL as a thrombophilic factor, the PAI-1 mutation has a prominent frequency in our group.

### P3879

#### The treatment of sub massive pulmonary embolism: Thrombolytic or heparin?

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**Introduction:** Thrombolytic therapy (TT) decreases mortality and morbidity in the patients with massive pulmonary embolism (PE) when compared to heparin therapy. However the use of TT in patients with sub-massive PE remains controversial.

The aim of these studies to compare the efficiency of heparin and TT for sub-massive PE.

**Material and method:** Patients with sub-massive PE who were treated during the last five years were included in this study. Patients who have significant hypoxemia or expansive thrombosis or proximal DVT were given TT and the others were given heparin. These groups were compared for demographics, risk factors and echocardiography findings (72nd hour, 6th and 12th month).

**Results:** Totally 39 patients (20 female, 19 male) were included. The mean age was 57 years, the mean duration of follow up was 3.5 years. There was no difference for age, gender, risk factors between TT (n=20) and heparin (n=19) groups. Mean pulmonary arterial pressure (PAP) was 49mmHg in heparin group and 64mmHg in TT group. PAP at 72nd hour was significantly lower in TT group than the heparin group ( $p < 0.001$ ). PAP at 6th and 12th months were still lower in TT group than heparin group but it was not statistically significant. There was no mortality or major bleeding due to the TT or heparin.

**Conclusion:** As a result of our study TT decreases PAP significantly at 72nd hour in the patients with sub-massive PE so that TT could be the first choice therapy for these patients.

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## 401. Pulmonary circulation: acute and chronic pulmonary embolism

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### P3877

#### Evaluation of quality life indices in patients after pulmonary embolism

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**Background:** Pulmonary embolism (PE) is a multifactorial disorder as a complication of many diseases which remains an urgent problem of medicine. Study of indices of changes of physical abilities, psychic state and social adaptation of an individual defined as quality of life are important in treatment of patients with PE.

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**P3880**

**Dear colleagues: D-dimer is not always necessary – Reduce the cost of your hospitals!**

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**Introduction:** Pulmonary embolism (PE) is a major international health problem and may be fatal. Its overestimation may enhance the cost of the hospitals, but underestimation risk the patient's life as well. D-dimer has high sensitivity but low specificity for detection of PE.

**Objectives:** To evaluate the effectiveness of D-dimer in patients with PE and its impact in the budget of our hospital.

**Materials and methods:** This is a retrospective study of 150 patients with PE confirmed by Angio-CT from January - May 2011. All patients of this group had high risk factors, clinical signs of PE and high score in clinical probability according to Geneva and Wells. D-dimer was performed in all of patients.

**Results:** There were 105 male and 45 female. D-dimer was positive in 102 cases (68%), and negative in 48 cases (12%).

**Discussion:** The cost of D-dimer for 1 patient in Albania is 12€, for 150 patients is 1800€. It is evident: in 12% of cases D-dimer was negative in patients with confirmed PE. In the other group, the clinical data and high score clinical probability are sufficient as indication for the angio-CT. So, further laboratory examinations, including D-dimer may be avoided, especially in developing countries, where the cost of these tests is high for the hospitals. D-dimer is necessary in low and medium clinical probability cases.

**Conclusion:** In patients with high risk factors and a clear anamnesis of PE, D-dimer is not necessary. Avoiding it may reduce the hospital expenses.

**P3881**

**Prognostic role of cardiac troponins and simplified pulmonary embolism severity index in patients with normotensive pulmonary embolism**

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The new, high-sensitivity troponin T (hsTnT) assay may improve risk stratification of normotensive patients with acute pulmonary embolism (PE). Simplified Pulmonary Embolism Severity Index (sPESI) has shown prognostic accuracy.

We aimed to investigate whether risk stratification by cardiac troponin testing improves the prediction of clinical outcomes in patients with a sPESI. The primary end point of the study was adverse 30-day outcome, defined as death from any cause or nonfatal recurrent venous thromboembolism or nonfatal major bleeding. 18 (14.9%) adverse events within 30 days diagnosis of PE. The sPESI classified 76 patients (62.8%) to the high-risk category ( $\geq 1$  point[s]). Of patients with low sPESI, had hsTnT  $\geq 0.014$  pg/mL was 14(31.1) patients. Low sPESI and hsTnT  $< 0.014$  had occurs non-fatal hemorrhage in a patient. The adverse event rate rose from 0% in patients with sPESI  $\geq 1$  or positive hsTnT, and further to 14% in those with hsTnT  $\geq 0.014$  pg/mL+ sPESI  $\geq 1$ . The adverse event rate rose from 1.6% in patients with sPESI  $\geq 1$  or positive cTnT, and further to 12.4% in those with cTnT  $\geq 0.01$  pg/mL+ sPESI  $\geq 1$ . Of the 121 study patients, the hsTnT  $\geq 0.014$ + sPESI  $\geq 1$  point(s) had a higher sensitivity, and a higher negative predictive value than the cTnT  $\geq 0.01$ + sPESI  $\geq 1$  point(s) combinative model for predicting 30-day adverse outcome in the study.

In conclusion, cardiac troponin testing may not be required for the minority of patients with a low sPESI but it no adds prognostic information. Risk stratification with the combination of sPESI and cardiac troponin may also serve for aggressive PE treatment strategies.

**P3882**

**Wells clinical prediction rule and pulmonary embolism rule out criteria (PERC) in preventing over investigation of pulmonary embolism in emergency departments**

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**Background:** Depending on the worse outcomes of missed diagnosis of pulmonary embolism (PE), unnecessary diagnostic tests are usually ordered to most of the patients with dyspnea or pleuritic chest pain.

**Aims:** To identify rates and causes of overinvestigation for PE in our emergency department (ED) and to search whether it was possible to reduce this overinvestigation by using Wells score and Pulmonary Embolism Rule Out Criteria (PERC) in daily practice.

**Methods:** A retrospective observational cohort study performed in an ED of a tertiary care university hospital. 108 patients, who had diagnostic tests with the suspicion of PE, were included in the study.

**Results:** Among the whole study group, 53(49%) were diagnosed as PE (+) and overdiagnosis was present in 55 (51%) patients i.e., PE (-). The sensitivity of high

Wells score was 43%, specificity 78%, positive predictive value 66% and negative predictive value 59% for PE diagnosis. PERC criteria found to be negative (when all of the 8 criteria were fulfilled) in only 5 (5%) patients. The sensitivity of the test was 98%, specificity 7%, positive predictive value %50, negative predictive value %80. When individual parameters of PERC were evaluated solely for the exclusion of PE; “no leg swelling” and “no leg swelling” were found significantly negatively correlated with the diagnosis of PE ( $p=0.001$ ,  $r=-0.325$  and  $p=0.013$ ,  $r=-0.214$  respectively)

**Conclusion:** Over investigation of PE in EDs still remains as an important problem. In order to prevent this, the clinical prediction rules must be developed further or may be used in combination.

**P3883**

**Predictors of poor outcome in chronic thromboembolic pulmonary hypertension**

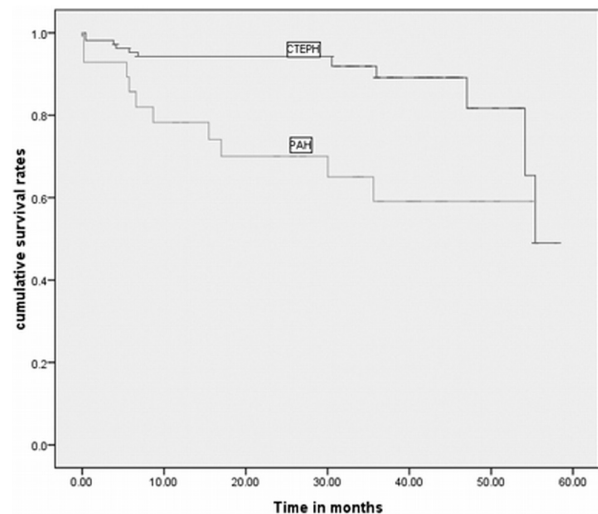
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**Background:** Clinical and plasma biomarkers are essential to predict the outcome of pulmonary arterial hypertension (PAH). These markers might also be useful to evaluate the outcome of chronic thromboembolic pulmonary hypertension (CTEPH).

**Objective:** Assess the cumulative mortality and identify predictors of the patients with CTEPH.

**Methods:** 108 patients with CTEPH who registered in Beijing chaoyang hospital between January 2006 and October 2011 were analyzed. The primary endpoint is death, and the second endpoint is worsen of WHO functional class.

**Results:** During the follow-up period (4-58 months), 11 patients died (10.2%), meanwhile WHO functional class of 4 patients was worsen (3.7%). The 1-,3-year survival rates were respectively 95.1% and 82.1%. BMI (HR 0.798; 95% CI, 0.677 to 0.941;  $P=0.007$ ), leukocyte (HR 1.346; 95% CI, 1.145 to 1.582;  $P<0.001$ ), ESR (HR 1.043; 95% CI, 1.010 to 1.077;  $P=0.011$ ), cardiac output (CO) (HR 0.484; 95% CI, 0.243 to 0.962;  $P=0.039$ ), pulmonary vascular resistance (PVR) (HR, 1.002; 95% CI, 1.001 to 1.003;  $P=0.001$ ) were independent predictors for poor prognosis of CTEPH patients. Meanwhile 54 patients with PAH were enrolled, and the 1-,3-year survival rates of PAH patients were 78.8% and 59.4% respectively.



**Conclusion:** Patients with CTEPH have a better survival rate than patients with PAH. BMI, inflammatory markers (leukocyte, ESR), hemodynamic parameters (CO, PVR) were associated with poor prognosis of patients with CTEPH.

**P3884**

**Daytime measurements underestimate nocturnal oxygen desaturations in pulmonary arterial and chronic thromboembolic pulmonary hypertension**

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**Background:** Nocturnal hypoxemia is important in precapillary pulmonary hypertension (pPH) as it worsens pulmonary hemodynamics. Whether daytime oxygen saturation (SpO<sub>2</sub>) predicts nocturnal hypoxemia in pPH patients has not been conclusively studied. Therefore, we investigated the prevalence of nocturnal hypoxemia in ambulatory pPH patients in comparison to daytime SpO<sub>2</sub> and disease severity.

**Methods:** Consecutive patients diagnosed with pPH classified as either pulmonary arterial (PAH) or chronic thromboembolic pPH (CTEPH) had daytime resting and exercise SpO<sub>2</sub> (at the end of 6-minute walk test), thereafter they underwent

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overnight pulse oximetry at home. Functional class, pro-BNP and tricuspid pressure gradient were assessed.

**Results:** 63 patients (mean age $\pm$ SD 60 $\pm$ 15, 43 females) with PAH (44) and CTEPH (19) were included. The resting SpO<sub>2</sub>, exercise SpO<sub>2</sub> and mean nocturnal SpO<sub>2</sub> were 94 $\pm$ 3, 87 $\pm$ 9 and 89 $\pm$ 4%. 49 patients (77%) spent >10% of the night with SpO<sub>2</sub> <90% (desaturators), 33 (52%) spent >50% of the night with SpO<sub>2</sub> <90% (sustained desaturators). The positive predictive values of a daytime SpO<sub>2</sub>  $\geq$ 91% to predict nocturnal desaturation or sustained desaturation were 75 resp. 47%. Nocturnal SpO<sub>2</sub> was negatively correlated with the tricuspid pressure gradient, but not with functional class, 6MWT and pro-BNP.

**Conclusion:** Nocturnal hypoxemia is very common in PAH and CTEPH despite often normal daytime SpO<sub>2</sub> and reflects disease severity. Nocturnal pulse oximetry should be considered in routine evaluation of pPH patients and research be directed to the treatment of nocturnal desaturation in pPH.

### P3885

#### The PESI, the simplified PESI and the shock index for identification of high-risk and low-risk patients with acute pulmonary embolism

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We compared the test characteristics of the pulmonary embolism severity index (PESI), the simplified pulmonary embolism severity index (sPESI) and shock index (SI) for predicting 30-day outcomes in a prospective study of 132 patients with objectively confirmed pulmonary embolism (PE). The primary outcome of the study was 30-day mortality.

Overall, 13 (9,8%) out of 132 patients died during the first month. The SI classified fewer patients as high-risk (41 (31,1%) out of 132 patients, compared to sPESI (45 (34,1%) and compared to PESI (57 (43,2%). High-risk patients based on the SI had a higher mortality than those based on the sPESI and PESI (31,7% versus 22,2% and 17,5%). Low-risk patients based on the SI had a lower mortality than those based on sPESI and PESI (0% versus 3,4% and 4%).

The SI quantified the prognosis of patients with PE better than sPESI and PESI.

### P3886

#### Analysis of the association between protein C gene single nucleotide polymorphism and pulmonary thromboembolism in Chinese population

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**Background:** We investigated the role of protein C (PC) polymorphism in patients with PTE in order to find out the correlation between its polymorphism and the susceptibility of the Chinese population to develop PTE.

**Methods:** Sixty three consecutive patients with PTE were enrolled as the investigated group and eighty six healthy people as the control group. C/T at the position of 2405 and A/G at the position of 2418 in the PC gene promoter region were detected through polymerase chain reaction-restriction fragment length polymorphism analysis.

**Results:** (1) The results suggested that the genotype frequencies of the two SNPs when combined together were not significantly different between two groups ( $P > 0.05$ ). However, the allele frequency of the C2405T SNP was significantly different between the case and control group. The frequency of T allele in the PTE group was higher. (2) These results suggested that there were six different kinds of genotype distribution (TA - TA, TA - CA, TA - CG, CG - CG, CA - CG, CA - CA) and three different kinds of haplotype (TA, CG, CA).

**Conclusions:** These results suggest that the two polymorphisms present in the control region of PC gene are associated with an increased susceptibility to PTE in the Chinese population. The 2405T allele may be a possible risk factor for the development of PTE while the C allele may probably be a protective factor of PTE. Moreover, the TA haplotype may also be associated with an increased risk for developing PTE.

### P3887

#### Venous thromboembolism in lung cancer with clinical analysis of 89 cases

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**Objective:** The aim of this study was to investigate the associated clinical factors and to provide evidences for prevention and therapies of VTE in lung cancer patients.

**Methods:** We retrospectively reviewed the clinical data of 2,053 lung cancer patients with definite diagnosis by cytology or pathology between July 2008 and June 2010 at Shanghai Pulmonary Hospital.

**Results:** In 2,053 lung cancer patients, 89 were confirmed with VTE. The incidence rate of VTE in Adenocarcinoma patients and non-adenocarcinoma patients was 5.65% and 3.02%. The incidence rate of VTE in Stage I~IIIa lung cancer

patients was significantly decrease (1.48%) in comparison to that in stage IIIb~IV patients (5.74%). Significant difference of incidence rate of VTE was showed in the patients with or without comorbidities (2.70% and 6.73%;  $P < 0.01$ ). The incidence rate of VTE in pretherapy lung cancer patients with normal value of platelet count, D-dimer, IL-1 and TNF was 3.72%, 0.31%, 2.44%, 3.27%, respectively, whereas, the rate in pretherapy lung cancer patients with high value was 6.26%, 19.91%, 10.26%, 7.74% respectively ( $P < 0.05$ ). There were no relations between other clinical factors and the incidence of VTE. Logistic analysis showed adenocarcinoma, comorbidities, high value of D-dimer, IL-1, TNF in blood were the related important factors with increased VTE incidence.

**Conclusions:** Adenocarcinoma is the most common pathological type in lung cancer patients with VTE. The high risk factors of VTE include comorbidities and increase of D-dimer, IL-1 and TNF in blood. Close attention should be paid to those lung cancer patients with high risk factors of VTE.

### P3888

#### Pulmonary perfusion scan follow-up in patients with acute pulmonary embolism

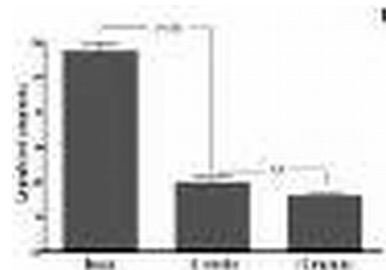
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**Introduction:** The role of pulmonary perfusion scan in the follow-up of pulmonary embolism (PE) is not clearly known

**Aim:** To assess the evolution of pulmonary perfusion after a symptomatic acute PE and the role of persistent perfusion defects in assessing the risk of recurrent PE.

**Methods:** A retrospective analysis (April 2005-May 2010) of patients with symptomatic acute PE for whom a pulmonary perfusion scan follow-up of at least 6 months was available. All scans were read independently by 2 readers whose agreement was calculated by kappa test. Recurrent PE was diagnosed on the basis of the presence of segmental perfusion defects not present at the previous control.

**Result:** The analysis refers to 252 patients, aged 69 $\pm$ 15 years (mean  $m$  SD). The kappa index ranged from 0.84 to 0.98 for the different times. The number of unperfused segments decreased from 5.8 $\pm$ 2.8 (baseline) to 2.1 $\pm$ 2.0 (6 months,  $p < 0.0001$ ) to 1.7 $\pm$ 1.8 (12 months, ns; ANOVA).



After a month from the diagnosis there were 16 recurrences; the number of unperfused segments at the last scan available prior to recurrence did not differ significantly from the number measured at the standard 6 months control in patients without recurrent PE.

**Conclusion:** After 6 months from acute PE there is a significant reduction in the number of unperfused segments which does not change significantly afterwards. The persistence of perfusion defects is not predictive for the development of later recurrent PE.

### P3889

#### (Contributing factors to) the diagnostic yield of CT pulmonary angiography: A retrospective study

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**Introduction:** Pulmonary embolism (PE) is a potentially life-threatening disease which requires quick and reliable diagnosis to start timely treatment. Clinical probability of pulmonary embolism is assessed by using a combination of Wells-score and D-dimer level. In most cases of PE, CT of pulmonary arteries (CTPA) provides a reliable diagnosis. In the Isala klinieken approximately 1000 CTPAs are performed annually, but its diagnostic yield and factors associated with improving it are unknown. In literature diagnostic yield varies from 7-31%.

**Aims:** To determine diagnostic yield of CTPA in our centre and factors associated with it. Differences between specialities as well as adherence to protocol were investigated.

**Methods:** All patients receiving a first CTPA for pulmonary embolism in 2010 were included. Data about relevant clinical information and requesting speciality were retrospectively obtained. Differences in diagnostic yield were tested using a Chi-square test. Independent predictors were identified with multivariate logistic regression.

**Results:** PE on CTPA was found in 224 of the 974 patients (23%). Between specialities, diagnostic yield varied from 19.5-23.9% (p=0,20). Independent predictors of diagnostic yield were: age, sex, D-dimer, chest pain, cough, dyspnea, cardiac history, COPD, atelectasis/consolidation, intrapulmonary mass and/or interstitial pulmonary disease on CT. Wells-scores were poorly documented (n=127, 13.1%). Poor adherence to protocol was also shown by a high amount of unnecessary D-dimer values with a high Wells-score (35 of 58; 58,6%).  
**Conclusions:** The diagnostic yield of CTPA in this study was relatively high. Better adherence to protocol might improve it further.

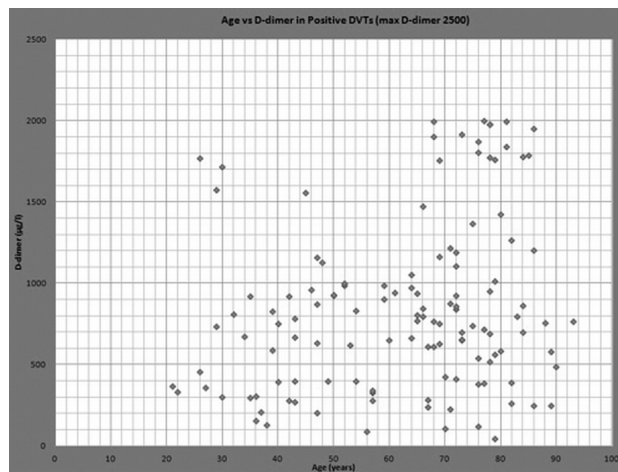
**P3890**  
**Should there be an age adjusted D-dimer cut-off value in diagnosing thromboembolic disease? A retrospective analysis**

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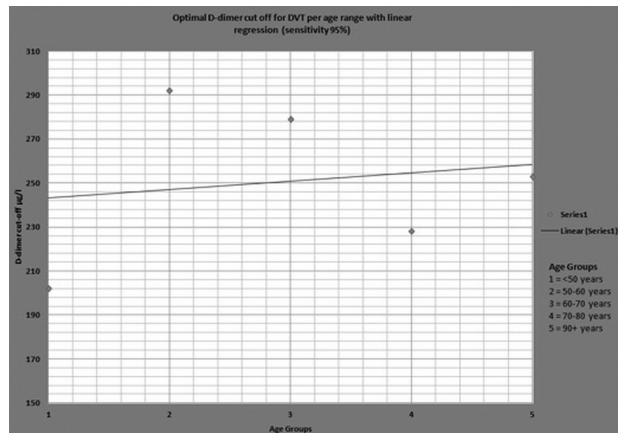
Previous studies using the enzyme-linked immunosorbent assay (ELISA) D-dimer in pulmonary embolism have suggested that the D-dimer cut-off should be adjusted for age. (Douma et al. BMJ 2010; 340 c.1475) Using a retrospective analysis from our DVT clinic we compared latex agglutination assay D-dimer values for patients without DVT in 10 year age brackets (1696 patients). There was a significant D-dimer level rise (compared to under 50 years) with advancing age.

Age (years)	50<	50-60	60-70	70-80	80-90	90+	All
D-dimer Mean (SD)	390 (740)	398 (734)	431 (619)	643 (891)	632 (807)	679 (631)	513 (777)
D-dimer Median	178	188	255	340	400	469	285
p value	-	>0.1	>0.1	<0.001	<0.001	<0.01	

We analysed the data from positive DVTs to look for an age adjusted D-dimer cut-off. (212 patients)



By generating receiver operating characteristics (ROC) curves we calculated 95% sensitivity D-dimer cut-off limits for the various age brackets. A clear relationship between age and D-dimer cut-off could not be shown.



Our data again showed that D-dimer level rises with advancing age. However, with our assay an age adjusted D-dimer cut-off could not be deduced without reducing sensitivity.

**P3891**  
**Prognostic value of red cell distribution width in patients with pulmonary embolism**

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Elevated red blood cell distribution width (RDW) has been associated with adverse outcomes of heart failure and pulmonary hypertension. We speculated that a higher RDW would be independently associated with poor clinical outcomes in pulmonary embolism (PE) patients.

A total of 702 consecutive patients with acute PE were evaluated. We collected each patient's base-line characteristics including RDW. The primary end-point was all-cause in hospital mortality. Receiver operating characteristic (ROC) analysis was performed to determine the optimal RDW cut-off levels with regard to prognosis. We used logistic regression to assess the association between RDW at the time of presentation and in-hospital mortality after adjusting for patient (age, clinical and laboratory variables) factors.

There was a graded increase in mortality rate with each RDW quartiles: 5.8% in quartile I ( $\leq 13.6$ ), 9.7% in quartile II (13.7-14.5%), 13.1% in quartile III (14.6-16.3%) and 20% in quartile IV ( $> 16.3$ ) (p for trends  $< 0.001$ ). Patients who died had higher baseline RDW values [16.1% (11.7-28.3) vs 14.5% (10.7-32.5) p  $< 0.001$ ]. The optimal cutoff value of RDW for predicting in-hospital mortality was  $\geq 15\%$  and the negative predictive value was 93% for mortality. In multivariate regression analysis, RDW remained associated with an increased odds of death. RDW levels may provide a potential marker to predict outcome in PE patients.

**P3892**  
**Angiogenesis in chronic thromboembolic pulmonary hypertension (CTEPH)**

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**Background:** Chronic thromboembolic pulmonary hypertension (CTEPH) is characterized by organized thrombi in the pulmonary arteries leading to right heart failure and death. In a murine venous thrombosis model we were able to demonstrate that endothelial cell-specific deletion of vascular endothelial growth factor receptor 2 (VEGF-R2)/fetal liver kinase-1 leads to misguided thrombus resolution. Following the hypothesis that CTEPH is based on inadequate thrombus resolution, we studied the role of angiogenesis in CTEPH.

**Methods:** Fibrotic CTEPH thrombi, their red fresh portions, and unthrombosed pulmonary arteries were collected from patients undergoing pulmonary endarterectomy. Real Time PCR, immunohistochemistry, *in vitro* 3D angiogenesis and proliferation assays were performed.

**Results:** Biochemical analyses revealed that angiogenic molecules such as angiopoietin-2, VEGF, basic fibroblast growth factor and markers for endothelial cells (ECs) such as VEGF-R2, von Willebrand factor and VE cadherin were decreased in CTEPH thrombi compared with pulmonary arteries and fresh pulmonary clots. However, homogenized CTEPH thrombi promoted angiogenesis in an *in vitro* 3D angiogenesis assay, and stimulated the proliferation of human umbilical vein ECs.

**Conclusion:** Angiogenic molecules are downregulated in fibrotic CTEPH thrombi compared with parent pulmonary arteries and fresh clots. However CTEPH thrombi appear to promote angiogenesis using ECs from healthy donors. Downregulation of genes involved in angiogenesis and lack of functional ECs in CTEPH thrombi may drive thrombus persistence, while the angiostimulatory effect of devascularized thrombi may attract bronchial artery collateralization in the direction of the thrombus.

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**Demographics, clinical characteristics, health resource utilization and cost of patients with CTEPH: Retrospective results from six European countries**

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**Objective:** To describe demographics, treatment patterns, health resource utilization and related costs of patients with chronic thromboembolic pulmonary hypertension (CTEPH) in 6 European countries.

**Methods:** We reviewed medical charts from patients diagnosed with CTEPH and treated with medications for pulmonary arterial hypertension (PAH): Endothelin

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receptor antagonists (ERA), PDE-5-inhibitors (PDE5i) or prostacyclin analogues (PA). Demographic and clinical characteristics, medications, and health resource utilization were retrospectively abstracted from patients' medical records at specialized PH treatment centers from 6 European countries. Resource utilization was valued using country-specific unit costs; descriptive statistical analyses were performed.

**Results:** Twenty-one hospitals documented 119 CTEPH patients over 25.4 months time. Patients were inoperable (83.2%) or persistent after surgery (16.0%) with mean age  $67.5 \pm 12.1$  years, 61% female, 6-minute walking distance  $297 \pm 119$  meters, and NYHA class II/III/IV in 27/59/14%. At baseline, 59.7% patients received ERA, 34.4% PDE5i, and 5.8% PA. CTEPH patients experienced  $1.8 \pm 2.2$  hospitalizations per year accounting for  $14.8 \pm 26.1$  days in hospital. Annual cost of PAH-specific medication was the predominant economic factor averaging  $\text{€}36,768 \pm \text{€}22,630$  per year. Hospitalization costs ( $\text{€}4,496 \pm \text{€}7,923$ ) and concomitant medications ( $\text{€}2,510 \pm \text{€}2,503$ ) were lower. Other health care resource items accounted for marginal additional costs.

**Conclusion:** These data show clinical characteristics and cost estimates for CTEPH patients receiving off-label therapy with medications that have been approved for PAH.

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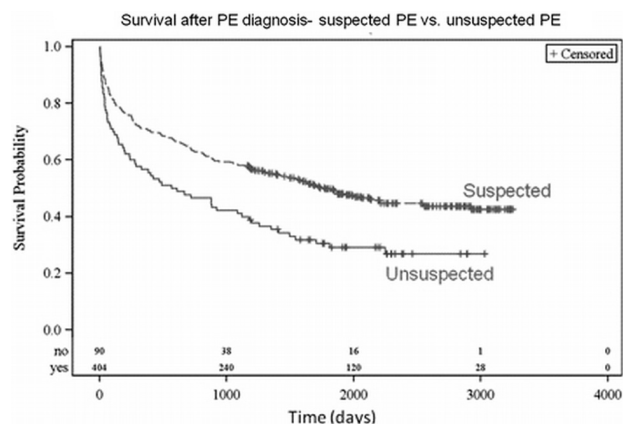
#### Clinical characteristics and outcomes of patients with clinically unsuspected pulmonary embolism versus patients with clinically suspected pulmonary embolism

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**Background:** The routine use of multidetector computed tomography (MDCT) has led to increased detection of unsuspected pulmonary embolism (UPE). Our aim was to compare the characteristics and prognosis of patients with UPE to patients with suspected PE (SPE).

**Methods:** We retrospectively reviewed the charts of patients diagnosed with PE in a community-based university hospital between the years 2002-2007. UPE was defined as PE detected on CT scans performed for indications other than PE. We compared patients with UPE to patients with SPE for differences in clinical features, ECG, imaging, and echocardiographic findings. We assessed the long-term outcomes of patients.

**Results:** Of 500 patients with PE, 408 had SPE and 92 had UPE. Patients with UPE were similar to patients with SPE regarding age and sex distribution. Malignancy was more prevalent in UPE patients (39% vs. 23%,  $p < 0.0068$ ). UPE patients had significantly less tachypnea, dyspnea chest pain, and hypoxemia. Mortality was higher in UPE patients (70.3% vs. 53%,  $p = 0.0029$ ). The mortality hazard ratio after adjustment for age, sex and malignancy was 1.546 (95% CI, 1.139-2.099,  $p = 0.0052$ ).



**Conclusions:** We suggest that UPE is more prevalent in patients with a malignancy and is associated with higher mortality despite a less severe clinical presentation. UPE may be a marker of poor prognosis.

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#### Clinical utility of the pulmonary embolism rule-out criteria (PERC) in investigation of possible pulmonary embolism

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The PERC score was proposed as a means of identifying patients who are at low risk of pulmonary embolism (PE) by Kline et al in 2004. We retrospectively applied the PERC rule to patients who presented to our institution between May 2007 and

November 2008 who had a CT Pulmonary Angiogram (CTPA) for the investigation of possible PE. We postulated that a sequential exclusion process - using PERC, a dichotomous Wells score (cutoff at greater than 4), and then d-dimer if indicated would improve the diagnostic process by reducing unnecessary d-dimer testing and exposure to ionizing radiation.

249 CTPAs were performed for possible PE, clinical notes being available on 220. 186 patients were PERC positive, 34 negative. 174 had elevated quantitative d-dimer assays, and 52 had positive CTPA investigations. The positive predictive value of the PERC score was 28% and the negative predictive value 100%. D-dimer assay had a positive predictive value of 21.8% but a negative predictive value in our series of only 72.4%. Importantly in our study group no patients with a positive CTPA had a negative PERC score. The result of this small, retrospective, study suggest that the addition of the PERC score prior to standard testing would result in fewer negative CTPA examinations and/or d-dimer assays (reducing inappropriate exposure to ionizing radiation and costs). We suggest the PERC score as an additional risk stratification tool first line prior to the Wells (or Geneva) score and d-dimer assays. The format of the PERC domains may also reduce inter-operator variability in junior staff who may struggle with "Alternative diagnosis less likely than PE", a clinical gestalt question.

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#### Diffusing capacity for carbon monoxide and mortality in patients with chronic thromboembolic pulmonary hypertension

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**Background:** Diffusing capacity for carbon monoxide (DLCO) reflects the ability of gas exchange across the alveolar-capillary interface and is also used as a marker of pulmonary vascular disease. Recently, Chandra et al. reported that DLCO predicts mortality in patients with pulmonary arterial hypertension. However, there is little data about DLCO in chronic thromboembolic pulmonary artery hypertension (CTEPH).

**Objectives:** The aim of this study is to reveal the correlation between DLCO and other clinical markers and to evaluate DLCO as a predictor of mortality in CTEPH patients.

**Methods and results:** We performed observational retrospective study of 202 consecutive patients with CTEPH (female 69.8%, age  $54.6 \pm 12.8$  yrs., 99:medial, 103:surgical) who underwent both pulmonary function test including DLCO and right heart catheterization from 1986 to 2011 in Chiba University Hospital. %DLCO showed correlation with age, NYHA, Hugh-Jones classification, oxygen delivery,  $PvO_2$ , %VC, %FEV1 and 6 minutes walk distance. However, no correlation was shown between %DLCO and mean pulmonary artery pressure, pulmonary vascular resistance,  $PaO_2$  and  $AaDO_2$ . Among surgically treated patients, there is no difference about operative mortality between normal %DLCO ( $\geq 70\%$ ) group and decreased %DLCO group ( $< 70\%$ ) (11.7% vs. 13.3%,  $p = 0.8166$ ). Among the medically treated patients, decreased %DLCO group showed significantly poor survival than normal %DLCO group (5-year survival 69.1% vs. 86.0%  $p = 0.0263$ ).

**Conclusion:** Decreased DLCO was associated with impaired quality of life, pulmonary function, oxygen delivery in CTEPH, and predicted the mortality in medically treated patients.