

**Safety of outpatient  
management of Pulmonary  
Embolism: 2010 – 2018 in a  
large teaching  
hospital**

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# Outpatient versus inpatient treatment for acute pulmonary embolism

Cochrane Review 2019

Authors' conclusions: Currently, only low-quality evidence is available from two published randomised controlled trials on outpatient versus inpatient treatment in low-risk patients with acute PE. The studies did not provide evidence of any clear difference between the interventions in overall mortality, bleeding and recurrence of PE

# What Causes death in PE ?

- Acute fall in cardiac output
- Caused by:
  - Physical obstruction with thrombus
  - Release of vasoconstrictive mediators (causing vascular shunting as well)
- In fit patients, haemodynamic disturbance correlates with extent of obstruction
- Unpredictable (and earlier) when pre-existing heart or lung disease

# What correlates with poor prognosis?

- Patients presenting with right ventricular dysfunction (approx. 40%). (*Sanchez 2008*)
- Elevated cardiac biomarkers (Troponin & Brain natriuretic peptides) identify patients with ventricular strain. (*Becattini 2007, Klok 2008*)
- Echocardiography not readily available and the combination with biomarkers uncertain

# Grades of Pulmonary Artery Obstruction

- *5-15% obstruction:*  
Hypoxaemia
- *25% obstruction:*  
pulmonary hypertension (>20mmHg) & right ventricular dysfunction
- *40% obstruction:*  
pulmonary hypertension critical
- *>50% obstruction:*  
PA pressure falls
- *Acute systemic shut-down:* hypotension & shock, caused by inadequate left ventricular filling

# 'Approx 50% patients with PE are safe to treat as outpatients'

Baglin 2010

- But Which 50% ?
- Massive PE – 12% patients die (*RIETE*)
- Non-massive PE – 3% patients die (*RIETE*)
- Many more patients present with non-massive PE – causing >90% deaths
- Therefore, which patients with non-massive PE are safe to treat as outpatients?
- Answer = risk stratify using models to predict early embolic death

# A suggested simplistic risk stratification for OP treatment of PE

*Baglin T 2010*

- Without serious co-morbidity (cancer, heart failure, chronic lung disease)
- Pulse  $<100 \text{ min}^{-1}$
- BP  $>100 \text{ mmHg}$
- Not requiring Oxygen
- Clear instructions to patients re symptoms to watch out for
- Decision made by experienced clinician



# Pulmonary Embolism Severity Index (PESI) model. *Aujesky D 2005*

- Demographics

- Age +Age
- Male sex +10

- Co morbidities

- Cancer +30
- Heart failure +10
- Chronic lung disease +10

- Clinical findings

- Pulse >110 bpm +20
- BP <100 mmHg +30
- RR >30 per min +20
- Temp <36°C +20
- Altered mental state +60
- Arterial O<sub>2</sub> Sat <90% +20

Class I. V. Low risk = <65 points

Class II. Low risk = 66-85 points

Class III. Intermediate risk = 86-105 points

Class IV. High risk = 106-125 points

Class V. High risk = >125 points

# PESI validation

- Derivation sample = 10,534 US patients
- Validation sample = 367 EU patients
- Mortality (90 day) all cause = 6.3%, gradation according to classes 1-V:  
I. = 0%, II. = 1.0%, III. = 3.1%, IV. = 10.4%, V. = 24.4%
- No patients in class I or II developed recurrent VTE or major bleeding
- Patients in risk class I or II are potential candidates for OP treatment. Representing 44% patients in derivation cohort. NPV = 99.4%

# PESI low risk trial: results

	Outpatient	Inpatient
Recurrent VTE	1/171 (0.6%)	0/168
Death	1/171 (0.6%)	1/168 (0.6%)
Major bleeds (14 days)	2/171 (1.2%)	0/168
Major bleeds (90 days)	3/171 (1.8%)	0/168

Mean length of stay: OP = 0.5 days (SD 1.0), IP = 3.9 days (SD 3.1)

'In selected low risk PE patients OP care can be safely and effectively used in place of IP care'

# Simplified PESI score

- *Jiminez D et al. RIETE investigators. Arch Intern Med 2010;170(15):1383-1389*
- Univariate logistic regression for association between variables in original PESI and death @ 30 days.
- Removal of variables with no mortality association
- Age >80 = 1, Cancer = 1, heart failure or chronic lung disease = 1, pulse >110 = 1, BP <100 = 1, Arterial O<sub>2</sub> <90% = 1
- 0 = low risk (31%), 1 or more = high risk (61%)
- Negative predictive value = 99%

# Algorithm for assessing safety of OP management of PE ( Mod PESI)

**THE PATIENT MUST SATISFY ALL OF THE FOLLOWING CRITERIA FOR OP MANAGEMENT:**

Pulse < 100 bpm

Systolic BP > 100 mmHg

O2 sats >95% on room air

No RV strain on ECG

Troponin T negative

No co-morbidity requiring hospital admission

Mobile and able to travel to and from hospital

Social situation adequate

No contra-indications to anticoagulation

# Plymouth Data 2010 - 2018

- Retrospective cohort study all PE diagnoses
- Positive events identified from daily review targeted radiological investigations (CTPA, V/Q & DUS) also whether HAT events
- Patient management system used to look at LOS, readmission rates and mortality
- Mortality comparing inpatient with outpatient at 7 and 28 days examined

# Definitions Used

- Outpatient PE- Discharged within 24 hours of diagnosis or not formally admitted e.g. Ambulatory Care
- Readmission- within 28 days of diagnosis and reason associated with PE
- Mortality- All cause mortality within 28 days of diagnosis

# Total VTE 2010 - 2018

<b>YEAR</b>	<b>Total VTE</b>	<b>Total PE (% Total VTE)</b>
2010	640	355 (55)
2011	782	464 (59)
2012	795	486 (61)
2013	805	481 (60)
2014	787	465 (59)
2015	834	526 (63)
2016	862	477 (55)
2017	836	509 (61)
2018	824	485 (59)
Total	7165	4248 (59)



# PE 2010 -2018

<b>YEAR</b>	<b>Total PE</b>	<b>Inpatient</b>	<b>%</b>	<b>Outpatient</b>	<b>%</b>
2010	355	244	69	111	31
2011	464	339	73	125	27
2012	486	305	63	181	37
2013	481	296	62	185	38
2014	465	290	62	175	38
2015	526	295	56	231	44
2016	477	270	57	207	43
2017	509	269	53	240	47
2018	485	275	56	210	43
Total	4248	2583	61	1665	39

# Treatment of PE 2015-2018

Drug	all PE 1980 (%)	% Change (95% CI)
Apixaban	143 (7.2)	11.93 (9.59 – 14.46)
IVC Filter	3 (0.2)	0
Dabigatran	2 (0.1)	0
LMWH	749 (37.8)	(3.48) (-1.049-7.99)
None	20 (1.0)	0
Rivaroxaban	955 (48.2)	(1.7) (-3.11-6.5)
Warfarin	108 (5.5)	(9.54) (4.067-8.79)

# Mortality (Inpatient)

<b>YEAR</b>	<b>Mortality 7 days Inpatient</b>	<b>Mortality 28 days Inpatient</b>	<b>All Mortality within 28 days</b>
2010	9	20	29
2011	20	32	52
2012	20	22	42
2013	18	35	53
2014	11	2	13
2015	12	15	27
2016	16	15	31
2017	9	19	28
2018	13	13	26
Total	128	173	301

# Mortality (Outpatient)

<b>YEAR</b>	<b>Mortality 7 days outpatient</b>	<b>Mortality 28 days outpatient</b>	<b>All Mortality within 28 days</b>
2010	0	2	2
2011	0	0	0
2012	0	3	3
2013	0	2	2
2014	2	4	6
2015	1	3	4
2016	0	0	0
2017	0	4	4
2018	0	1	1
Total	3	19	22

# Comparison Mortality

- Inpatient total 301/2583 12% Mortality within 28 days of diagnosis with 5% 128/2583 within 7 days
- Outpatient total 22/1665 1.3% Mortality within 28 days with 0.2% 3/1665 within 7 days
- Acknowledging inpatient population likely to have more co-morbidities and PE diagnosed during inpatient stay for other reasons

# Outpatient Readmissions

<b>YEAR</b>	<b>All Outpatient Readmitted</b>	<b>Outpatient readmitted 7 days</b>	<b>Outpatient readmitted 28 days</b>
2010	4	3	1
2011	3	3	0
2012	1	0	1
2013	3	3	0
2014	1	0	1
2015	2	2	0
2016	4	1	3
2017	5	1	4
2018	7	3	4
Total	30	16	14

# Total VTE Scans 2015-2018

Scan Type	Total Number	Positive Events (%)
CTPA	8221	1394 (17)
V/Q Scans	3139	599 (19)
Doppler Ultrasound	11581	1360 (12)

# V/Q vs CTPA Management

Scan Type	Total Positive	IP (%)	OP (%)
CTPA	1394	947 (68)	447 (32)
V/Q	599	163 (27)	436 (73)



# Results

- Over 9 years 1665/4248 PE patients 39% treated as outpatient
- The number treated as outpatients increased from 31% in 2010 to 43% in 2018
- Outpatient 28 mortality 1.4% compared with 12% for inpatients
- Over 9 years only 23 patients readmitted 1.6% due to issues with thrombosis

# Results

- PE diagnosed by V/Q scan compared with CTPA more likely to be treated as outpatient
- More patients now seen in Ambulatory Care which opened during the study period
- Change in PE treatment increased DOAC usage may impact on patient management
- Number of bed days saved over study period in excess of 5000

# Thank You

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