Acute pulmonary embolism –
Aspects on lung function, functional capacity and respiratory symptoms

Jenny Danielsbacka

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SAHLGRENSKA UNIVERSITY HOSPITAL

Why make studies at all on patients with pulmonary embolism?

Same care to patients with similar symptoms?

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Pulmonary embolism

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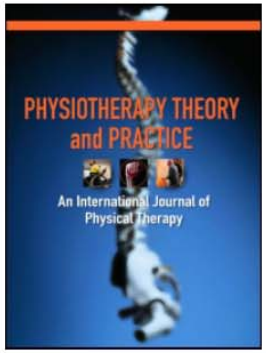
Pulmonary embolism

Pneumonia



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Lung function, functional capacity, and respiratory symptoms at discharge from hospital in patients with acute pulmonary embolism: A cross-sectional study

Jenny S. Danielsbacka, Monika Fagevik Olsén, Per-Olof Hansson & Kaisa Mannerkorpi

Background

- There are previous studies on haemodynamic variables and functional capacity through the six-minute walk test (6MWT) and heart rate recovery (HRR) in patients with PE. (Ciurzyński, 2004, Stevinson, 2007, Kline 2009, Yan 2012, Chow, 2014, Kahn 2017)

- Measurements were conducted between one week after diagnosis and up to seven years after having PE.

- Within our knowledge there are no studies focusing on lung function, functional capacity and respiratory symptoms at discharge after hospitalization due to acute PE.

Aims of the study

- The aim of the present study was to examine and describe lung function, functional capacity and respiratory symptoms at discharge after hospitalization in patients with acute pulmonary embolism and compare to reference values for spirometry and the six-minute walk test.

- An additional aim was to compare lung function, functional capacity and respiratory symptoms between patients with small or large arterial obstruction.

Method and materials

- The participants were recruited consecutively from to the Acute Medical Unit at Sahlgrenska University Hospital, Gothenburg, Sweden.

- Inclusion criteria: patients with verified acute PE between 30-70 years of age and able to read and understand Swedish.

- Exclusion criteria: previous acute PE, dementia, pregnancy, orthopedic condition affecting walking ability, serious psychiatric or physical conditions as progressive cancer, neuro muscular disease, unstable angina pectoris, myocardial infarction < 1 month before the admission for PE, congestive heart failure and chronic obstructive pulmonary disease.

Method and materials

- The tests was performed at the Physiotherapy Department at Sahlgrenska University hospital the day for discharge.
- Spirometry was performed according to guidelines of the European Respiratory Society and the 6MWT conducted according to the American Thoracic Society guidelines.
- Peak heart rate immediately after 6MWT and 2 minutes after the test were used to calculate the heart rate recovery at 2 minutes after testing (HRR2).
- A cut-off value of <22 bpm for HRR2 were chosen and classified as abnormal. (Cole et al 1999, Swigris et al., 2009)

Classification of occlusion

- Qanadli score (Qanadli et al 2001)
- A way to quantify the occlusion by the emboli
- Points are set and then converted to a percentage

- In this study Qanadli score group 1 (QS1) had occlusion between 2.5-30% and Qanadli score group 2 (QS2) had between 31-50% occlusion
- The calculations were made by an experienced thorax radiologist

Table 1. Demographics of included patients ($N = 50$) presented as mean (SD) or %.

	All	QS1	QS2
Male (%)	39 (78)	16 (84)	23 (74)
Qanadli score (%)	33.4 (17.6)	13.0 (9.3)	45.9 (5.2)
Age (years)	54.7 (9.9)	55.6 (9.5)	54.1 (10.3)
Height (cm)	178.4 (8.8)	179.3 (8.7)	177.8 (8.9)
Weight (kg)	88.6 (15.5)	87.4 (13.2)	89.4 (17.0)
Body mass index (kg/m^2)	28.0 (6.8)	27.5 (3.9)	28.3 (5.1)
Smokers (*n*, %)	8 (16)	1 (5)	7 (23)
Ex-smokers (*n*, %)	11 (22)	6 (31)	5 (16)
LTPAI total score (h)	6.5 (6.1)	6.1 (6.5)	6.8 (6.3)
Heart rate at rest (BPM)	76 (11.7)	75.8 (11.0)	75.5 (12.4)
Systolic blood pressure at rest (mmHg)	128 (12.0)	126.1 (12.6)	128.6 (11.7)
Diastolic blood pressure at rest (mmHg)	84 (6.8)	82 (7.3)	84 (6.5)
Shock index	0.59 (0.09)	0.60 (0.10)	0.59 (0.09)
Days hospitalized	3.02 (1.33)	2.53 (1.12)	3.32 (1.40)

SD, standard deviation; QS1, Qanadli score group 1 ($n = 19$); QS2, Qanadli score group 2 ($n = 31$); LTPAI, leisure time physical activity instrument; BPM, beats per minute.

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	All (n = 49)	QS1 (n = 19)	QS2 (n = 30)	p-Value QS1 versus QS2
Spirometry				
Forced vital capacity predicted (%)	92.6 (20.0)*	94.8 (20.7)	91.2 (19.7)*	ns
FEV_1 predicted (%)	88.9 (20.6)***	90.4 (20.3)	88.0 (21.0)*	ns
Respiratory pain before spirometry, VAS (mm)	0 (0–55)	0 (0–55)	0 (0–42)	ns
Respiratory pain after spirometry, VAS (mm)	0 (0–85)***	0 (0–85)*	0 (0–70) *	ns
	All (n = 47)	QS1 (n = 18)	QS2 (n = 29)	p-Value QS1 versus QS2
6WMT				
6MWD (m)	473 (127.5)	516 (98.4)	446 (137.4)	0.050
6MWD predicted (%)	77.6***	85.1***	73.0***	ns
Respiratory pain before 6MWT, VAS (mm)	0 (0–24)	0 (0–23)	0 (0–24)	ns
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Dyspnea before 6MWT, Borg 0–10	0.3 (0–3)	0.3 (0–2)	0.3 (0–3)	ns
Dyspnea after 6MWT, Borg 0–10	3 (0.5–7.5)***	3 (0.5–7.5)***	4 (0.5–7.5)***	0.010

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Results

- HRR2 was abnormal in 48% of all included patients, 26,1 ± 17.5

- When excluding patients with beta blocker (n=8)
  37% of the patients had an abnormal HRR2, 27,8 ± 18.2

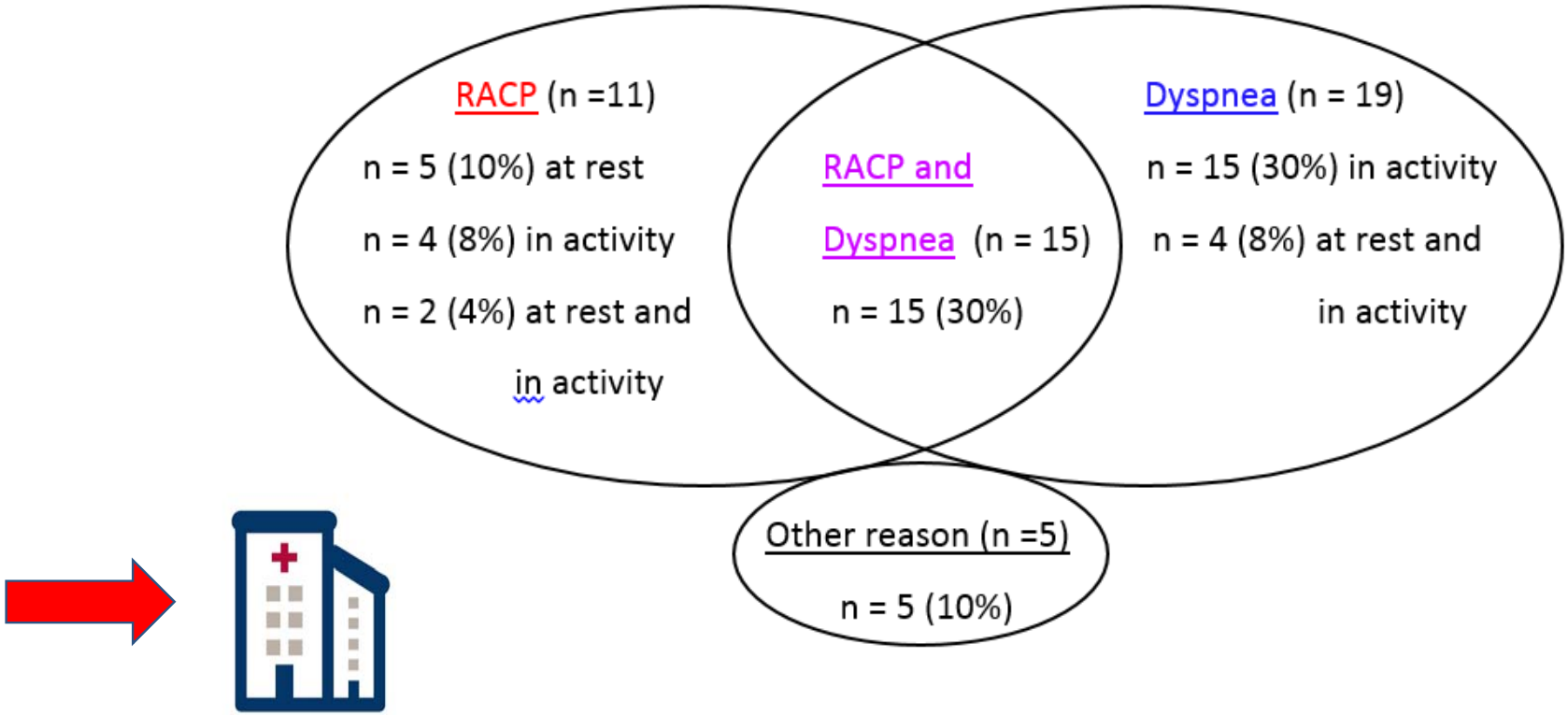

Figure 1. Reasons for seeking emergency care when diagnosed with acute pulmonary embolism, N = 50. In the combined RACP and Dyspnea group 5 patients had all four symptoms, 4 patients had RACP and dyspnea in activity, and 6 patients had different variations of the four symptoms.
RACP = respiratory associated chest pain

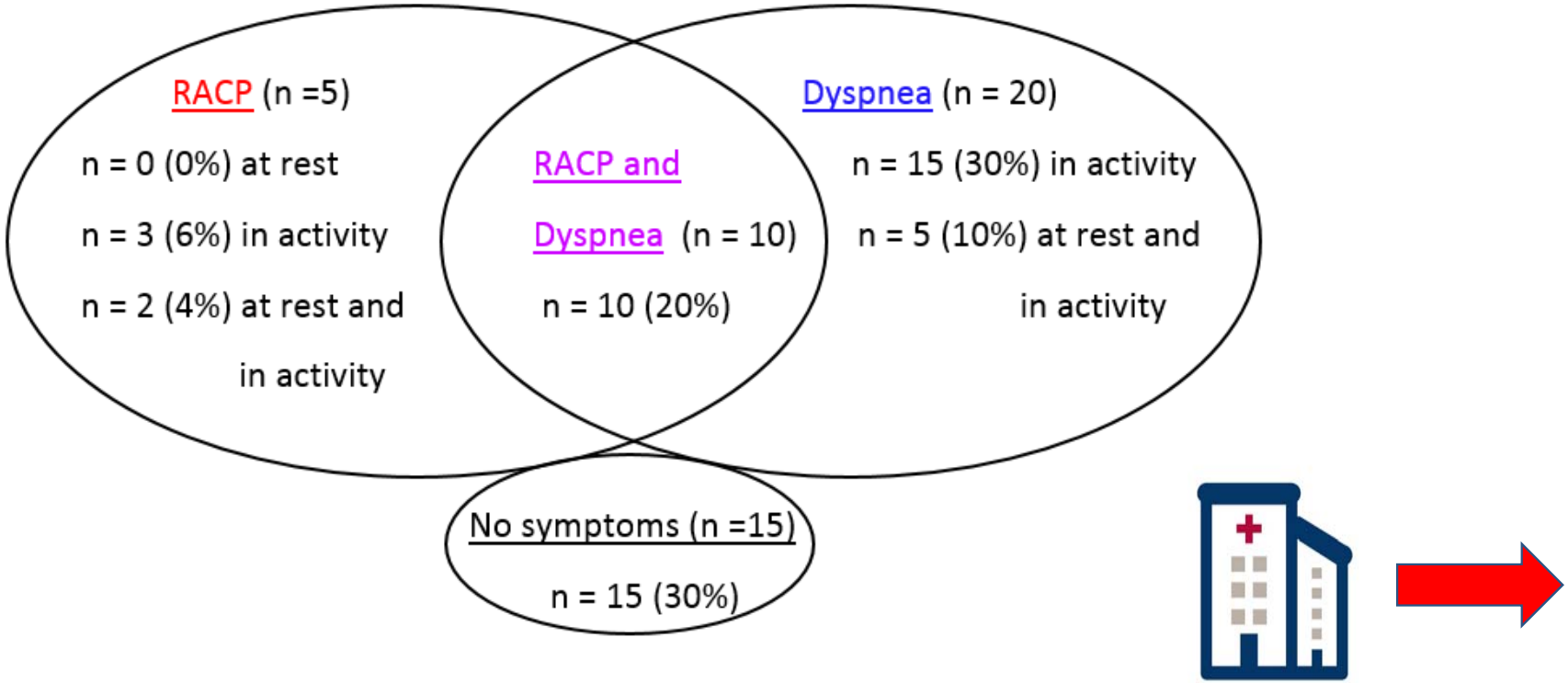

Figure 2. The patients' subjective experiences when asked about remaining respiratory symptoms at discharge after hospitalization with acute pulmonary embolism. Presented as % of the total group of patients, N = 50. In the combined RACP and Dyspnea group 3 patients had all four symptoms, and 7 patients had different variations of the four symptoms.
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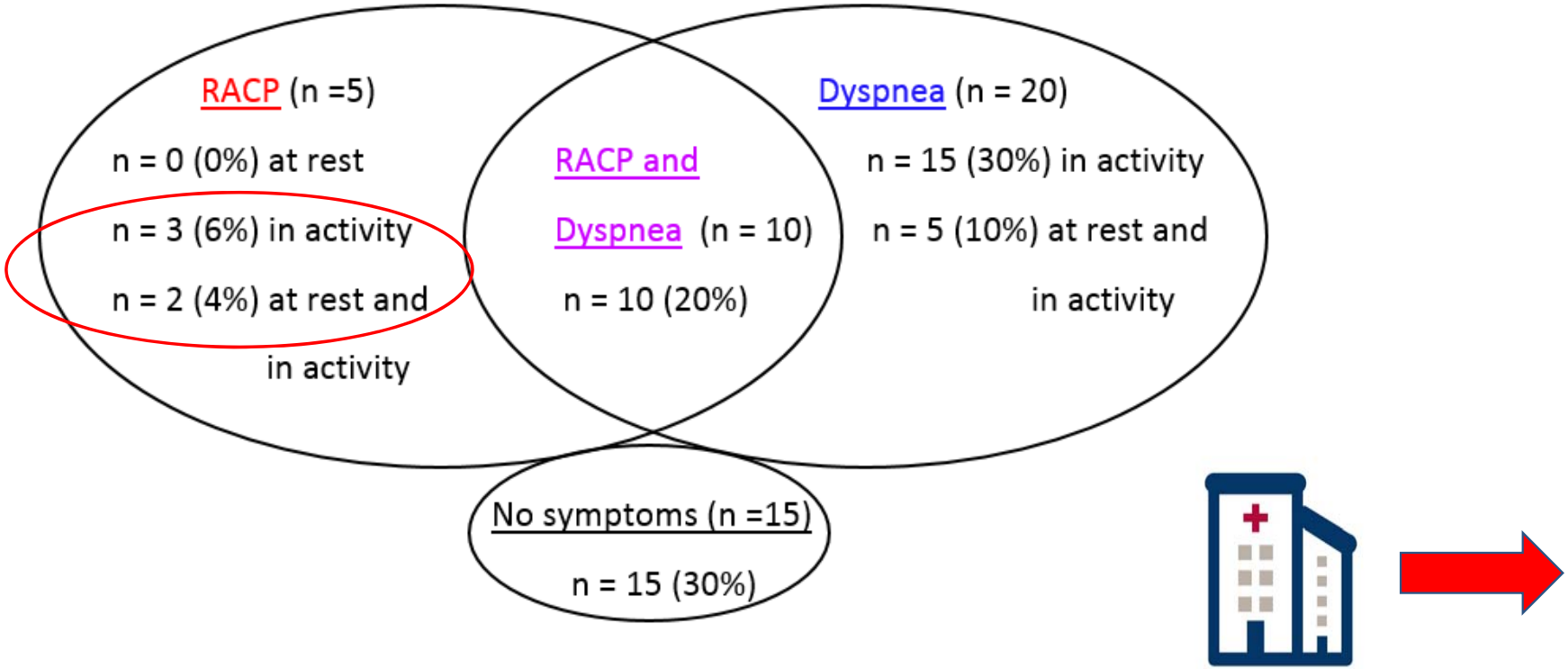

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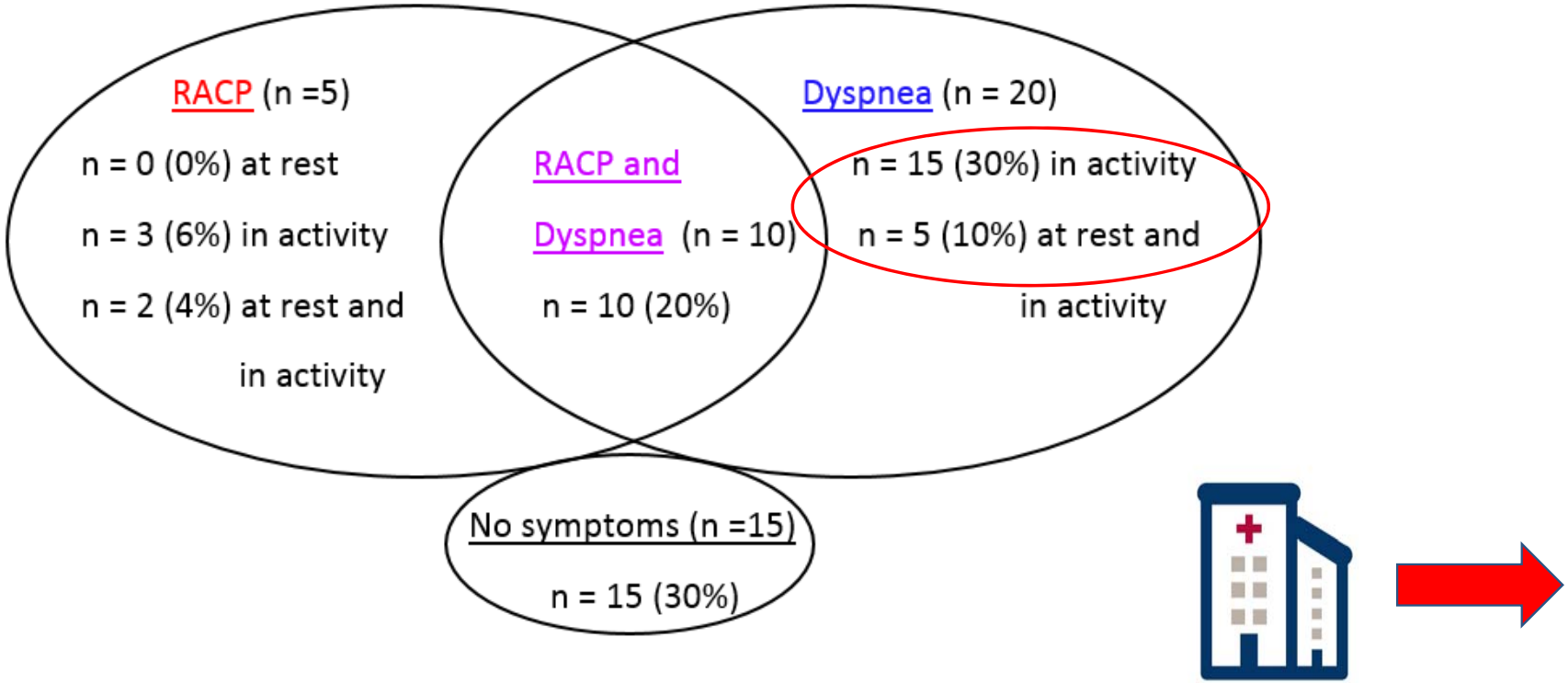

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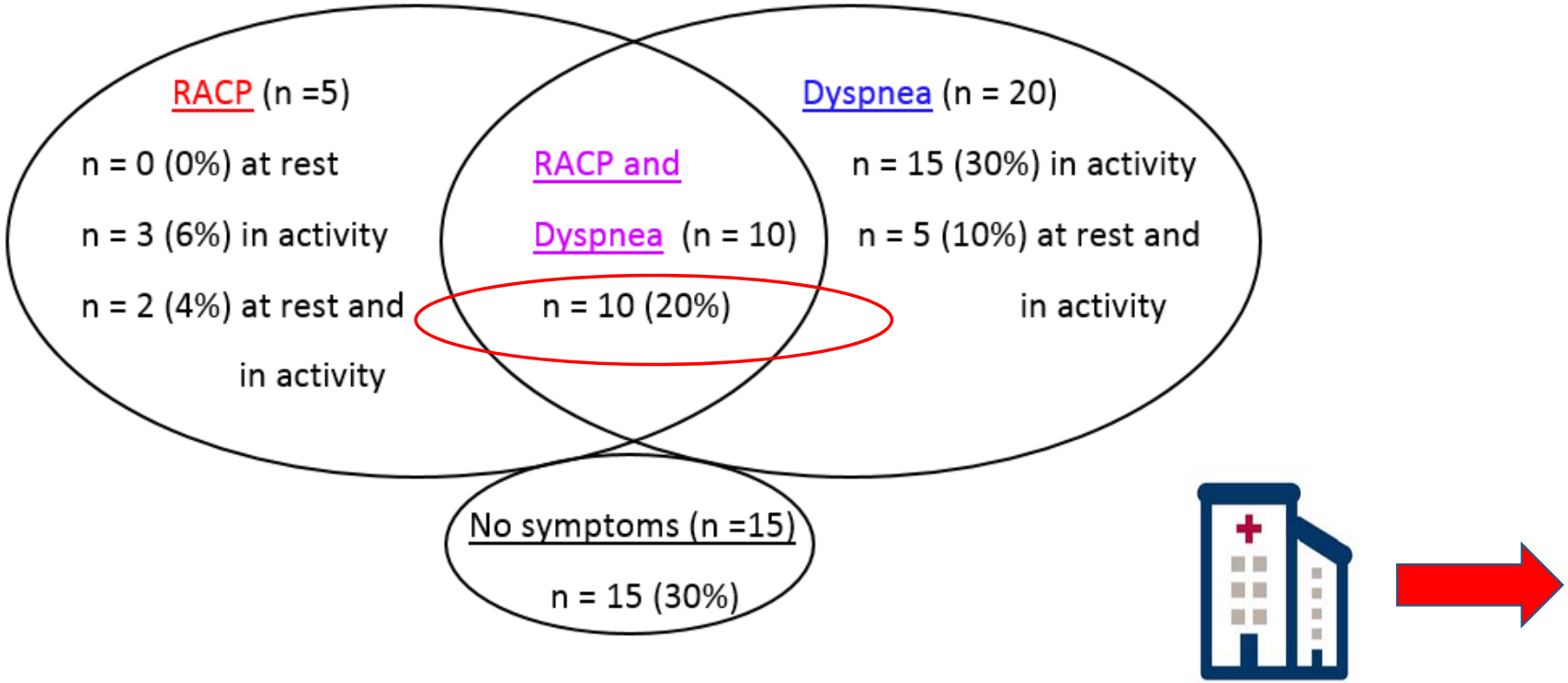

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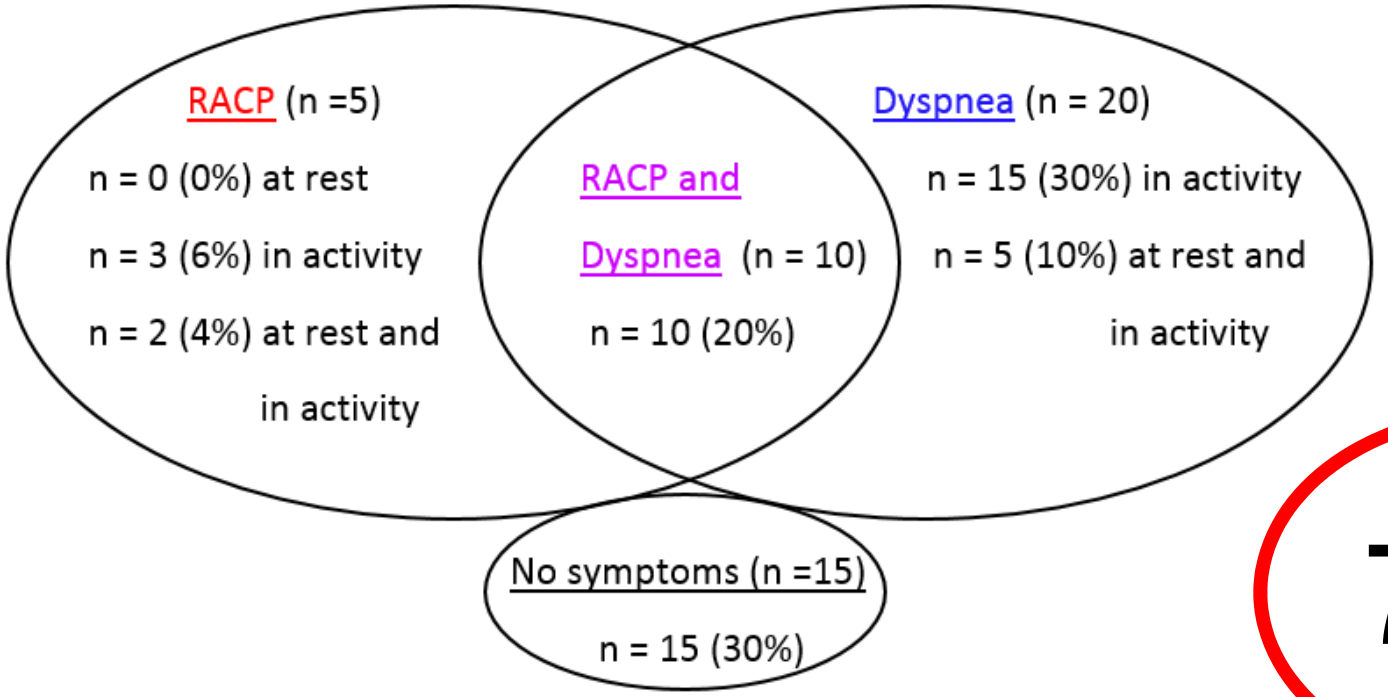

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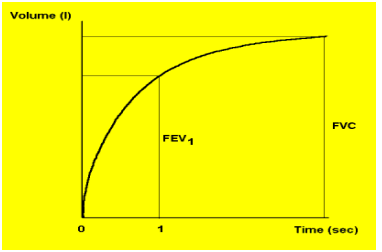
RACP = respiratory associated chest pain

Discussion



- FVC was 91% of the predicted value and FEV_1 88% of the predicted value.
- This indicates that patients with acute PE and without prior lung disease might experience physical limitations due to decreased lung function.
- However the durations of this decreased lung function is unknown and further studies are needed to examine this.

Discussion

- The 6MWD in the present study was significantly impaired compared to predicted values.
- In clinical practice we need to identify patients with an impaired 6MWD who are at risk of having a decreased physical activity level after discharge.
- The patients reacted positively to being given the opportunity to test their functional capacity before discharge.
- They stated that the performance of a 6MWT did strengthen their self-efficacy in managing physical performance such as walking.

Discussion

- Evidently there is a strong association between decreasing exercise capacity and an abnormal HRR in both men and women. (Cole 1999).

- It has been shown in a study that patients with abnormal HRR1 normalized their HRR1 after completing a 12 week rehabilitation programme with exercise 3 times a week. (Jolly 2011)

- Before discharge we need to identify patients with an abnormal HRR and encourage the patients to be physically active and even refer the patients to rehabilitation.

Discussion

- Patients still experience a high degree of respiratory symptoms at discharge
- Physiotherapists need to offer tools to the patients so that they can master their symptoms
- We need to prevent other illness, for example pneumonia, due to impaired breathing caused by respiratory associated pain
- Strenghten the patients self-efficacy regarding being able to perform physical activity despite their respiratory symptoms

Conclusion ?!

- The present study indicates that patients with acute PE have a reduced lung function, reduced functional capacity and abnormal HRR2 after 6MWT at discharge.
- 70% of the patients still had respiratory symptoms at discharge from hospital
- In clinical practice we need to identify these patients to be able to give advice concerning physical activity after hospitalization.
- Further studies with larger sample size studying lung function, functional capacity and HRR2 at both discharge and long term follow-up in patients with acute PE is needed.

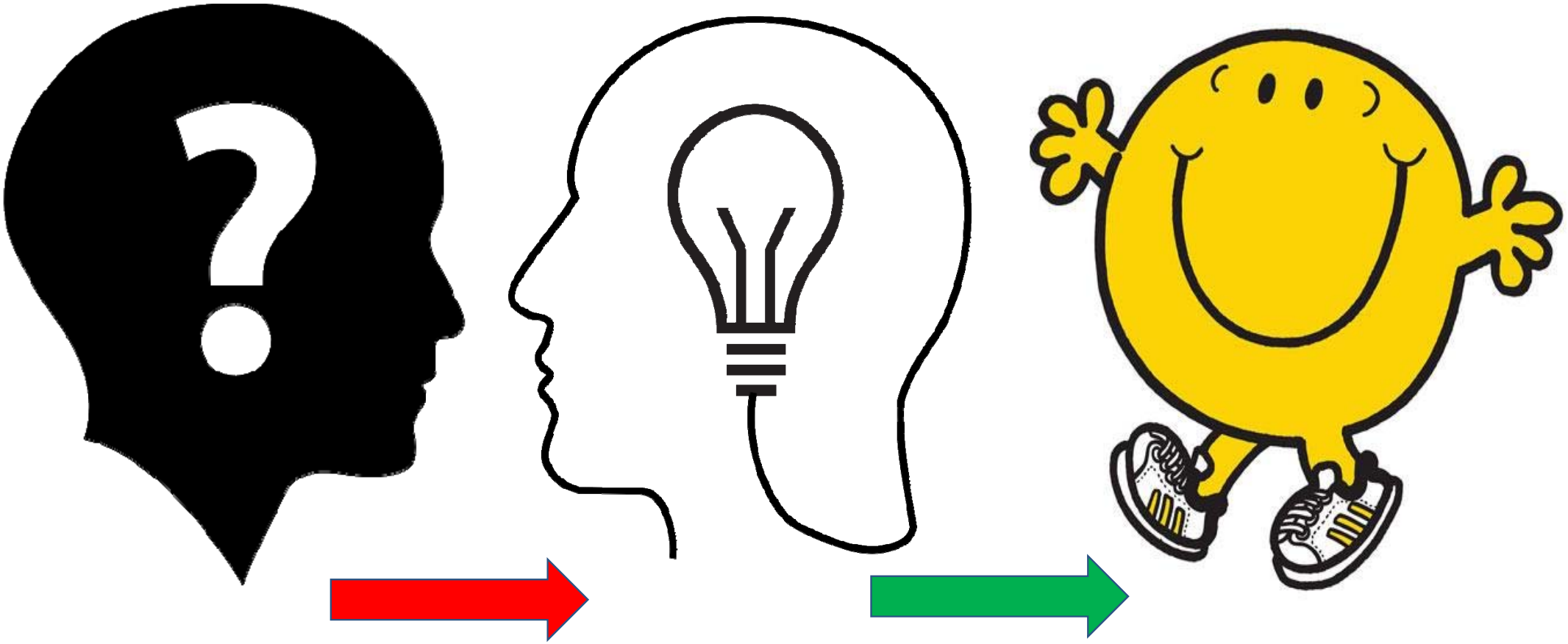
Apart from the study – two clinical scenarios

What happens if:

- The patient believes that the emboli can move to the brain?
- If the doctor tells the patient to ”take it a little bit easy”

What happens if:

- The physiotherapist informs the patient about the importance of physical activity after having PE
- The physiotherapist says that physical activity even enhances the fibrinolysis



Mange tak…

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