SAFETY OF A PULMONARY EMBOLISM AMBULATORY TREATMENT PROGRAM

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ABSTRACT

Objective: Evidence has emerged that out-patient management of pulmonary embolism may be an appropriate option in selected patients. This report is based on a safety data on a Pulmonary Embolism Ambulatory Treatment program.

Methods: An observational study in acute assessment unit from 2000 – 2006, of all consecutive patients with confirmed pulmonary embolism (high probability ventilation perfusion scan or Computerized Tomography Pulmonary Angiography) have been evaluated. Exclusion criteria were oxygen saturation less than 92%; systolic blood pressure less than 100 mm Hg; significant cardiopulmonary or renal disease, and a bleeding risk. Patient treated initially with low molecular weight heparin followed by oral anticoagulants when diagnosis was confirmed, and were assessed at 3 and 6 months.

Results: Sixty-one patients (33 females), median age 55 (range; 16-89 years) were eligible. Patients needed a maximum of 13 appointments. Risk factors included surgery (8.2%), cancer (8.2%), long travel (14.8%), previous thromboembolism (14.8%), hormonal replacement therapy (3.3%) and contraceptive pill (8.2%). No risk factor was identified at 37.7%. The mortality was zero at 6 months. No complications were recorded. Four patients required hospital admission, all within the first week; all were discharged within 24 hours. The median length of stay for patients with uncomplicated pulmonary embolism was 7 days; implementation of the pulmonary embolism ambulatory treatment program saved 427 bed days.

Conclusion: The pulmonary embolism ambulatory treatment program was cost effective and was not associated with serious complications. Further evaluation of these programs could help establish the safety and cost effectiveness of this approach.

Keywords: Pulmonary embolism, Ambulatory treatment, Cost effectiveness

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INTRODUCTION

Suspected pulmonary embolism is a common diagnostic presentation to emergency services, requiring a complex diagnostic pathway, treatment protocol and significant bed use. The advent of once daily low molecular weight heparin (LMWH) has the potential to be used in an out-patient setting. LMWH has been shown to be as efficacious as fractionated heparin in the treatment of deep vein thrombosis or pulmonary embolism[1]. Furthermore, randomized studies have established that out-patient management of deep vein thrombosis (DVT) with LMWH is at least as effective as in-hospital management with unfractionate heparin[2-3]. The British Thoracic Society Guidelines recommended that the current organisation for outpatient management of DVT should be extended to include patients with stable pulmonary embolism (PE) (level C)[4]. Although randomized controlled trial to validate the safety of this approach is still underway, many studies have suggested that treatment of PE as an outpatient is cost-effective and is safe in selected low risk patients[5-8]. Treatment of PE in the outpatient setting, however, has not been widely adopted in the UK. In this study, it was evaluated the safety and the cost-effectiveness of Pulmonary Embolism Ambulatory Treatment (PEAT) program at James Cook University Hospital.

METHODS

An observational study of all consecutive patients with confirmed PE who was presented to the Acute Admissions Unit (AAU) at the James Cook University Hospital from 2000 – 2006. All patients were evaluated for clinical probability for PE according to the Wells score[9]. All patients were risk stratified according to the set exclusion criteria (Table 1), modified from Pulmonary Embolism Severity Index[10,11], Geneva Criteria[12] and other studies[6-7]. Only those with low risk were regarded suitable for outpatient treatment, and included in the study.

For the sake of the study, confirmed PE was defined as one of the following: 1. High probability ventilation / perfusion scan (VQ scan); 2. Intermediate probability ventilation / perfusion scan with DVT, present in compression Doppler ultrasound of the leg; and 3. Positive Computerized Tomography Pulmonary Angiography (CTPA).

VQ scan or CTPA were usually performed within 48 hrs. Probability of VQ scan was classified into low, intermediate or high according to defined criteria.

The treatment protocol (Fig. 1) was a daily subcutaneous injection of low molecular heparin. Patients with confirmed PE were started on warfarin and monitored by the

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Table 1. Criteria for outpatient therapy of pulmonary embolism at James Cook University Hospital. KEY: HIT stand for heparin induced thrombocytopenia, ICH for intra-cerebral haemorrhage, GI/GU bleed for gastrointestinal bleeding, mo for month, O2 sat for oxygen saturation, BP for blood pressure, RR for respiratory rate.

1 – Compatible for outpatient therapy

- Outpatient follow-up feasible
- No allergy to warfarin / heparin
- No history of HIT

2 – Low bleeding risk

- Coagulopathy
- Active bleeding
- ICH (anytime) GI / GU bleed, trauma, surgery (1 mo)
- Platelets <50 X10^9 per litre

3 – Absence of severe renal dysfunction

- No acute syncopal episode
- O2 Sat > 92% on RA
- No prior cardiopulmonary disease
- Hemodynamically stable
  - Bp > 110 / 60
  - Pulse < 90
  - RR < 24
- Chest pain managed with simple analgesics

4 – Patient in stable condition
Ambulatory Emergency Clinic. Once targeted, International Normalized Ratio (INR) was achieved (INR between; 2-3), on two occasions the patient was discharged from the AAU clinic and then followed up by the GP, but were reviewed in the clinic after 3 and 6 months.

All patients were evaluated for symptoms or signs suggestive of bleeding, thrombocytopenia, DVT and PE.

RESULTS

Sixty-one patients (33 females and 28 males) with confirmed PE were managed on the PEAT program. Median age of the included patients was 55 (range; 16-89 years). The duration of Ambulatory Care follow up; patients needed follow-up for 5-13 days. In our hospital the median length of stay for patients with uncomplicated PE is 7 days, and therefore implementation of the PEAT program saved 427 bed /days.

Figure 2 demonstrates the percentage of patients according to risk factors for PE. Risk factors for PE included: surgery (8.2%), cancer (8.2%), long travel (14.8%), previous thromboembolism (14.8%), HRT (3.3%) and the contraceptive pill (8.2%). 37.7% had no risk factor identified.
No complications including bleeding and thrombocytopenia were recorded. Four patients required hospital admission, all within the first week for symptom control; all of them discharged within 24 hrs. Causes of hospital admission were pain management (n = 1), breathlessness (n = 1), and viral illness (n = 2). Those admitted with chest pain and breathlessness were regarded as cases of symptomatic recurrence of PE (2/61; 3.2%). No deaths or cardio pulmonary arrests were recorded (Table 2).

**DISCUSSION**

This present study has demonstrated the feasibility and the safety of providing outpatient care to patients with stable PE. Patients enrolled in our PEAT program have shown no mortality or evidence of venous thromboembolism recurrence over a period of 6 months follow-up. Only 4 patients required hospital admission (for pain control, breathlessness and viral illness), all within the first week for symptom control and discharged within 24 hrs. The two patients admitted for pain control and breathlessness were not evaluated for PE recurrence by imaging, and even if they had been regarded as recurrence of symptomatic PE, the percentage will be very low (2/61; 3.2%). There were no complications, including bleeding, related to this approach.

Several studies have evaluated the safety of outpatient treatment of PE with comparable results to our study[6-8]. Wells et al. have already examined the feasibility of outpatient management in 34 patients with PE as part of DVT outpatient setting with good overall outcome as in DVT[9]. The same authors evaluated the role of patient self-injection compared with injections administered by a homecare nurse in the outcome of outpatient management of PE, and found that both systems were safe and effective[7]. Similarly, Kovacs et al. in a non-randomised prospective study examined the safety of outpatient treatment of PE in 108 hemo-dynamically stable patients requiring no oxygen therapy, and with no severe pain requiring parenteral analgesia, or high risk of bleeding[8]. These authors found that of the 108 PE patients treated in the outpatient setting, the symptomatic recurrence rate of thrombo-embolism was 5.6% (6/108), which was the same as in the large randomised trials examining predominantly outpatient management of DVT[10,11]. Kovacs showed the rate of major bleeding was 1.9% (2/108), although 4 patients died, none were directly due to PE or major bleeding[9]. The symptomatic recurrence rate in our study was slightly lower (2/61; 3.2%) than these studies with no death, but this probably could be explained by the smaller number of patients included in our study. In addition, the criteria used in our study may be slightly different. Perhaps, the authors were a little overcautious in selecting patients for out-patient care, asking for systolic BP above 110, and oxygen saturation above 92% on room air, plus are probably more selective in the risk stratification of our patients. Indeed, recently Davies et al. in an early discharge/outpatient treatment of PE study (n 157) showed no recurrence of PE or major bleed, but there were 3 non-PE related deaths[12]. The selection process of outpatient management was not very clear in this study, and it was possible that the zero rate of recurrence was a reflection of a highly selected group of patients. Moreover, the fact that the study was not entirely conducted in the outpatient setting[13].

Different criteria were used by different studies to risk stratify patients. In particular, the pulmonary embolism severity index (PESI) has been validated by Aujesky et al. in a prospective study involving 119 European hospitals and 899 patients diagnosed with PE. In this study, 47% of the patients (426/899) were classified as low-risk, suitable for outpatient management. Low-risk patients had overall mortality of only 1.2% (5/426) and PE-specific mortality of 0.7% (3/426)[12]. The authors believe that PESI is time consuming, while the Geneva score requires blood gas measurement. Our criteria (Table 1) were derived from PESI as well as from other studies with satisfactory outcome[6-7]. As mentioned above, the authors felt a little overcautious in selecting low risk patients, looking for systolic BP above 110 and oxygen saturation above 92% on room air. Being more selective in our criteria may reflect our low mortality and recurrence rate. Further studies are needed to validate the criteria used in this present study.

<table>
<thead>
<tr>
<th>Adverse Event</th>
<th>Number Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>None</td>
</tr>
<tr>
<td>Bleeding adverse effect</td>
<td>None</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>None</td>
</tr>
<tr>
<td>Patient needing admission within a week of presentation</td>
<td>4 out of 61 patients</td>
</tr>
</tbody>
</table>

**Causes of hospital admission were**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Number Reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain management</td>
<td>n = 1</td>
</tr>
<tr>
<td>Breathlessness</td>
<td>n = 1</td>
</tr>
<tr>
<td>Viral illness</td>
<td>n = 2</td>
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In the James Cook University Hospital, normally the median length of stay for patients with uncomplicated PE is 7 days, suggesting that implementation of the PEAT program saved 427 bed days. This is equivalent to One Hundred Forty-Nine Thousand Five Hundred Pound Sterling (£149,500). It’s believed that the cost saving achieved by PEAT program was more than this amount. If taken into account, that many patients were investigated as an outpatient as part of PEAT program will have no thromboembolism, and these patients were not included in our study or calculations. Therefore, implementing PEAT program is cost effective and will lead to considerable saving of beds and funds. Surprisingly, this program has not been widely utilised in the UK and worldwide. Although, randomised trials evaluating the safety of outpatient vs. inpatient management of PE are underway, there is a strong amount of evidence available to support the safety of this outpatient approach in selecting low risk patients. Moreover, outpatient management may be preferred by the patients as indicated in Davies et al. study, in which 81 patients gave a score of 10 out of 10, while 97% of the patients indicated that they would prefer outpatient therapy if they had a subsequent PE[15].

REFERENCES