Surgical management of pneumothorax: significance of effective admission or communication strategies between the district general hospitals and specialized unit

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Abstract

A preoperative delay in emergency surgery for spontaneous pneumothorax is associated with a poor outcome after surgery and a prolonged hospital stay. To reduce preoperative delays, all tertiary referrals from district general hospitals to our thoracic surgery unit were processed through a ‘clinical decisions unit’ (CDU). Prior to the establishment of the CDU, these patients were added to a waiting list for a surgical bed. This study has reviewed the effect of this change in admission policy on the efficiency of treatment for non-elective spontaneous pneumothorax. An intergroup comparison (pre-CDU group vs. post-CDU group) was made of the following parameters: referral to transfer time, transfer to surgery time and length of inpatient stay in the referring and tertiary hospitals. There were no significant differences in gender, diagnosis, treatment in the referring hospitals, postoperative clinical outcome, or indications for or type of surgery. The total length of inpatient stay in the referring and tertiary hospitals was significantly reduced for the post-CDU group (12 vs. 15 days; P<0.001), which was attributed to the earlier transfer of patients (18 vs. 78 hours; P<0.001 hours). Allowing surgical access to a traditional medical admission unit is therefore, cost-effective and significantly improves the efficiency of non-elective pneumothorax surgery.

Keywords: Cost; Delays; Pneumothorax; Interhospital; Referrals; Tertiary; Transfers

1. Introduction

A proportion of patients with respiratory conditions who are admitted to district general hospitals require transfer to a tertiary thoracic surgery centre because of a local lack of specialist expertise and treatment facilities [1]. Although guidelines regarding the interhospital transfer of trauma patients exist to prevent any inadequacies in management [2], few published data exist on the impact of delays in the transfer of patients with non-trauma emergency respiratory conditions. However, evidence exists for non-respiratory conditions that make the pneumothorax surgery technically very difficult.

Prolonged waiting for transfer to a tertiary centre causes considerable anxiety to patients and accounts for suboptimal care [4]. Waiting is not only a cause of avoidable occupancy of National Health Service (NHS) beds, but is also associated with longer waits in Accident and Emergency departments and via interhospital transfers [3].

Video-assisted thoracoscopic surgery (VATS) is the widely accepted and preferred choice for the management of spontaneous pneumothorax due to better pain control and shorter hospital stay [7–10]. VATS bullectomy and pleurectomy is the preferred operation, with the addition of talc insufflations in patients over 50 years of age. Any preoperative delay has a serious effect on the outcome of surgery and is associated with a prolonged hospital stay [11]. This delay results in the development of interpleural adhesions that make the pneumothorax surgery technically very difficult.

In 2004, to reduce waiting time in the Accident and Emergency department, a 30-bedded ‘clinical decisions unit’ (CDU) was established in a tertiary centre with cardiothoracic surgical facilities. This unit had facilities including four isolation rooms, as well as 24-hour access for admission from general practitioners, from the Accident and Emergency department and via interhospital transfers.

Originally used for medical admissions, an access was obtained for interhospital thoracic surgical transfers. Prior to the CDU, tertiary referrals were processed via Bed Bureau and were added to the waiting list for a surgical bed. These patients had to wait for an availability of beds in the respiratory or thoracic surgical wards prior to their transfer. With the processing of interhospital referrals via the CDU, these
patients could be admitted directly to the CDU and then moved to a surgical ward once a bed became available. This study reviewed the effect of this change in admission policy on the efficiency of treatment for non-elective spontaneous pneumothorax. This study aimed to test the hypothesis that processing interhospital transfers via a medical admission unit would be efficient and cost-effective.

2. Methods

Patients were referred to the tertiary centre for thoracic surgery at Glenfield Hospital from respiratory and general physicians in six district general hospitals situated within a radius of 50 miles (80 km). All patients presenting with complicated spontaneous pneumothorax (persistent or recurrent) who required operative intervention were included in a retrospective audit of clinical outcome, allocated to groups as follows:

- Post-CDU group: patients transferred from district general hospitals and admitted directly to the CDU since the change in admission policy in June 2004. Once admitted to the CDU, these patients underwent preoperative investigations and then were either moved to a surgical ward or proceeded to surgery directly from the CDU. (Fig. 1 shows the pathway of admission via the CDU.) All patients returned to the thoracic surgical ward after operation.

- Pre-CDU group: patients transferred from district general hospitals and admitted to the respiratory or thoracic surgery wards via the bed bureau prior to the establishment of the CDU in April 2004.

Over a period of four years (June 2004–May 2008), 40 patients with persistent spontaneous pneumothorax were admitted through the CDU. This group was compared with 40 consecutive patients admitted to the thoracic surgical wards via the bed bureau over a period of four years (June 2000–March 2004).

An intergroup comparison was made of the following parameters: presentation to referral, referral to admission time, admission to surgery time and length of inpatient stay in the referring and tertiary hospital. Presentation was the time when the patient was first admitted to the hospital with pneumothorax. The time of referral was defined as the time when the surgical team were first made aware of the patient. Admission was defined as the time when the patient was admitted to the tertiary centre. Patients referred with traumatic and iatrogenic pneumothorax were excluded.

Data were collected by reviewing the paramedic transfer sheets and medical notes from district general hospitals and the tertiary centre. The date and time entries in the medical notes were checked against the computerised patient tracking system and referral letters. The categorical data (Table 1) were analysed using the $\chi^2$-test. The differences in clinical variables between the two groups were assessed with the Wilcoxon rank-sum test. All the statistical analyses were performed by using Microsoft Excel 2007. A $P$-value <0.05 was considered significant for all analyses.

3. Results

There were no significant differences in gender, diagnosis, treatment in the referring hospitals, or indications for or type of surgery performed between the two groups ($P>0.05$) (Table 1).

Eight patients in the pre-CDU group underwent open surgery due to surgeon choice or technical difficulties related to VATS. In cases where open surgery was performed,
muscle-sparing mini-thoracotomy was performed for better pain control and postoperative respiratory function. All patients in the post-CDU group underwent VATS, and for one patient this was converted to a muscle-sparing mini-thoracotomy.

One third of patients in the post-CDU group had a computed tomography scan of the chest in the referring hospital to exclude underlying pathology. The total length of inpatient stay in both the referring and the tertiary hospital was significantly reduced for the post-CDU group (12 vs. 15 days; \(P<0.001\)), which was attributed to an earlier transfer of patients: 18 (1.5–120) vs. 78 (3–148) hours (\(P<0.001\)). There was no significant difference in the length of inpatient stay after surgery (Table 2).

### 4. Discussion

This study provides a practical model for processing tertiary referrals and especially for handling the organisational aspects of interhospital transfer. Although this model poses the risk of unnecessary admissions to tertiary centres, such admissions can effectively be prevented through effective communication between clinicians.

In our admission process, once a referral had been communicated from the district general hospital, electronic radiological imaging files were transferred to the tertiary centre. After a review of the images and clinical details, the decision of admission was communicated to physicians and nursing staff in the referring hospital. The anticipated admission details were also passed on to the nursing staff in the CDU, where a bed was allocated to the patient.

This model of processing interhospital transfers through a medical admission unit has specifically reduced the number of telephone calls required to facilitate such a transfer, the time taken for a proposed transfer and the total time spent by the patient in hospital [1]. If implemented by other trusts, this model will effectively improve the quality of care and the outcome of surgery, and reduce stress for patients, relatives and physicians in the referring hospitals [4].

This study has also identified other factors contributing towards preoperative delay. Despite early transfers and an availability of surgeons, the time period from admission to the tertiary centre until surgery was not reduced in the post-CDU group. This was attributed to a lack of access to emergency operation theatres. At present, these patients are added to daily elective operating lists during weekdays, and range

### Table 2. Time intervals from presentation in the district general hospital to discharge from the tertiary hospital [data expressed as median, (25th – 75th centile) and range]

<table>
<thead>
<tr>
<th>Time interval</th>
<th>Pre-CDU group</th>
<th>Post-CDU group</th>
<th>(P)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median (25th–75th centile)</td>
<td>Median (25th–75th centile)</td>
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</tr>
<tr>
<td></td>
<td>Range</td>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>Presentation to referral (days)</td>
<td>5.5 (4.5–11)</td>
<td>5 (4.0–10)</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(2–24)</td>
<td>(2.0–16)</td>
<td></td>
</tr>
<tr>
<td>Referral to admission (hours)</td>
<td>78 (30–96)</td>
<td>18 (5.0–26.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>(3–148)</td>
<td>(1.5–120)</td>
<td></td>
</tr>
<tr>
<td>Admission to operation (hours)</td>
<td>42 (24–70)</td>
<td>46 (28–71)</td>
<td>0.15</td>
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<tr>
<td></td>
<td>(8–230)</td>
<td>(2–238)</td>
<td></td>
</tr>
<tr>
<td>Operation to discharge (days)</td>
<td>4.5 (3.25–7)</td>
<td>4 (2.5–7.5)</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(3–17)</td>
<td>(2–14.0)</td>
<td></td>
</tr>
<tr>
<td>Total length of hospital stay (days)</td>
<td>15 (10–25)</td>
<td>12 (8–21.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>(5–29)</td>
<td>(5–25.5)</td>
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</tbody>
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\(P<0.05\) deemed statistically insignificant. CDU, clinical decisions unit.
with some compromise related to the elective surgery. A dedicated emergency theatre would definitely help to improve the efficacy of treatment.

Millions of pounds are spent on an unnecessary occupation of beds in the UK’s NHS. A reduction in hospital bed utilisation has in recent years been a key strategy for controlling costs. Unnecessary bed occupancy results in an underachievement of cancer surgery targets, prolonged Accident and Emergency department waits and a low quality of care for patients.

In Leicester, the department of thoracic surgery contributed towards the cost of running the CDU. Our admission policy has reduced the total length of hospital stay and has saved £26,000 over a period of four years for a single respiratory condition, i.e. pneumothorax. Preoperative delays are also associated with a reduced success of VATS for post-pneumonic pleural empyema [12].

A prospective audit conducted over a period of six months identified 63 non-trauma emergency interhospital transfers to this centre. These patients were admitted to the CDU with eight different respiratory conditions, whereas a further 10 patients were admitted with pleural empyema. When used for other respiratory conditions, this admission pathway can be equally effective and cost-saving for such patients. This can also lead to an increased availability of beds and timely admissions via Accident and Emergency Departments in the referring hospitals.

An admission pathway via the CDU also helped to implement a strict infection control policy in which all the patients admitted from other hospitals were actively screened for methicillin-resistant Staphylococcus aureus infection [13].

This study indirectly provides evidence about the implementation of current British Thoracic Society (BTS) guidelines in the regional hospitals. BTS guidelines and evidence from other studies [14] suggest thoracic surgical consultation for persistent pneumothorax after five days of intercostal chest drain insertion for primary spontaneous pneumothorax, and after three days for secondary spontaneous pneumothorax. A recent audit has indicated a poor adherence to updated BTS guidelines for the management of pneumothorax in district general hospital [15]. Our study indirectly (Table 2) demonstrates that respiratory and general physicians are following the BTS guidelines but not strictly adhering to these for all cases.

There are few limitations to this study. One of the most important is the retrospective nature of the study as a bias in clinical coding and medical notes entries cannot be completely excluded for a retrospective study. Nevertheless, both cohorts were matched for different essential criteria, and the authors concluded that the use of a retrospective methodology did not influence or preclude important intergroup comparative outcomes.

The other key limitations were a lack of knowledge about transport arrangements and facilities. An efficiently running paramedic and ambulance service might have transported the post-CDU group of patients to the tertiary hospital in a timely manner, whereas had there been an overburdened service prior to establishment of the CDU, this could have caused delays in transfer. Nevertheless, the authors believed that such scenarios might not have been applicable for a majority of participants in the two cohorts and would not have affected the conclusion.

The incidence of disease limited the number of patients available for comparison in both groups, thereby lessen- ing the statistical power, but the case numbers do allow a meaningful statistical comparison. In addition, the study spans eight years, and other changes in practice over this time period (increased pressure on the use of hospital beds in district and tertiary hospitals, enhanced postoperative care and increased access to operating theatres) might have influenced the length of hospital stay.

It might be argued that a delay in acceptance of referral due to reviewing the investigation results might have contributed towards the prolonged length of hospital stay. However, the time-tracking for each patient was started on acceptance of the transfer to the tertiary centre. Furthermore, only 5% of patients in the pre-CDU group had imaging studies, and this would not be the cause of a significant delay in the transfer of this group of patients to the tertiary centre. Few important clinical details about the size of the pneumothorax, failed attempts at intercostal drain insertion, delayed review by the respiratory specialists and previous surgical interventions are missing, but in the context of study these details would not have made a significant difference.

5. Conclusions

Allowing surgical access to a traditional medical admission unit is a cost-effective model that significantly improves the efficiency of non-elective surgery for pneumothorax. We recommend that the effective communication between referring and tertiary centres, use of electronic images, anticipation of emergency admissions and availability of bed space in tertiary hospitals all can reduce preoperative delays and improve the efficiency of emergency surgery for non-traumatic respiratory conditions.

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