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Comparing Cost of Indwelling Pleural Catheter vs Talc Pleurodesis for Malignant Pleural Effusion

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BACKGROUND: Malignant pleural effusion is associated with short life expectancy and significant morbidity. A randomized controlled trial comparing indwelling pleural catheters (IPCs) with talc pleurodesis found that IPCs reduced in-hospital time and the need for additional procedures but were associated with excess adverse events.

METHODS: Using data from the clinical trial, we compared costs associated with use of IPCs and with talc pleurodesis. Resource use and adverse events were captured through case report forms over the 1-year trial follow-up. Costs for outpatient and inpatient visits, diagnostic imaging, nursing, and doctor time were obtained from the UK National Health Service reference costs and University of Kent's Unit Costs of Health and Social Care 2011 and inflated to 2013 using the UK Consumer Price Index. Procedure supply costs were obtained from the manufacturer. Difference in mean costs was compared using nonparametric bootstrapping. All costs were converted to US dollars using the Organisation for Economic Co-operation and Development Purchasing Power Parity Index.

RESULTS: Overall mean cost (SD) for managing patients with IPCs and talc pleurodesis was \$4,993 (\$5,529) and \$4,581 (\$4,359), respectively. The incremental mean cost difference was \$401, with 95% CI of −\$1,387 to \$2,261. The mean cost related to ongoing drainage in the IPC group was \$1,011 (\$732) vs \$57 (\$213) in the talc pleurodesis group ($P = .001$). This included the cost of drainage bottles, dressing changes in the first month, and catheter removal. There was no significant difference in cost of the initial intervention or adverse events between the groups. For patients with survival < 14 weeks, IPC is significantly less costly than talc pleurodesis, with mean cost difference of −\$1,719 (95% CI, −\$3,376 to −\$85).

CONCLUSIONS: There is no significant difference in the mean cost of managing patients with IPCs compared with talc pleurodesis. For patients with limited survival, IPC appears less costly.

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ABBREVIATIONS: HRG = Health Resource Group; IPC = indwelling pleural catheter; LOS = length of stay; NHS = UK National Health Service; TIME2 = Second Therapeutic Intervention in Malignant Effusion

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Malignant pleural effusion accounts for 22% of all pleural effusions, with > 150,000 cases diagnosed annually in the United States and > 1 million worldwide.[1,2] British Thoracic Society guidelines recommend that graded talc slurry be used as the sclerosing agent of choice delivered via an intercostal tube as first-line management for patients with malignant pleural effusion (herein referred to as talc pleurodesis); indwelling pleural catheter (IPC), or tunneled pleural catheter, insertion is recommended for a select subgroup. The delivery of the two interventions differs; talc pleurodesis requires up-front hospitalization, whereas IPC insertion, in general, is performed in an outpatient setting with ongoing drainage in the community thereafter.

The effectiveness of IPC insertion and talc pleurodesis has been compared in a randomized trial. The Second Therapeutic Intervention in Malignant Effusion (TIME2) trial measured symptom control and the subjective relief of malignant pleural effusion-related dyspnea with both treatment modalities.[3] Secondary outcomes of the TIME2 trial included quality of life and health-care costs. Although IPCs were not found to be superior to talc pleurodesis for relieving dyspnea or improving quality of life, the use of IPCs was associated with reduced hospital stay and decreased pleural procedures, although with more frequent adverse events. To our knowledge, the only other randomized controlled trial comparing safety and efficacy of IPC insertion and pleurodesis for malignant pleural effusion used doxycycline as the sclerosant.[4] In this study of 144 patients, there was no difference in effusion recurrence rate at 30 days or improvement in dyspnea or quality of life; however, there was a significantly shorter hospital length of stay (LOS) in the IPC group. Given the unknown impact of IPCs on resource use and costs, relative to standard care (ie, talc pleurodesis), a more thorough analysis of costs is warranted prior to recommendation of the adoption of IPC use as first-line management for patients with malignant pleural effusion.

Materials and Methods

Objective and Overview

Using clinical and resource data captured in the TIME2 trial, our primary objective was to compare total costs associated with the use of IPCs and with talc pleurodesis in patients with malignant pleural effusion. In a secondary analysis, we sought to compare the costs between groups across different categories (the initial procedure, adverse events, and those related to ongoing drainage).

TIME2 was a randomized controlled trial, conducted in seven centers across the United Kingdom, of 106 patients with confirmed malignant pleural effusion who were randomized to either IPC insertion or talc pleurodesis. Ethical and regulatory approval for the study was obtained from the Milton Keynes research ethics committee before recruitment commenced (REC number: 07/Q1603/2). After written informed consent, patients were randomized to receive either talc (chest tube and talc slurry pleurodesis) or IPC (Rocket Medical). IPCs were inserted in the outpatient setting (unless the patient was already admitted to hospital at the time of randomization, in which case the catheter was inserted in-hospital). Patients and their caregivers were instructed on how to perform drainage from the catheter. On average, the frequency of IPC drainage in the first 6 weeks of the trial was twice weekly, although this varied and was recorded in case report forms throughout the trial. All patients randomized to talc pleurodesis had a chest tube inserted and talc pleurodesis performed, if appropriate, in-hospital. Primary objective of the trial was to compare the efficacy of IPCs and talc pleurodesis at relieving dyspnea using the 100-mm visual analog scale. Baseline characteristics of the patients are summarized in Table 1.

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We conducted a cost analysis alongside the clinical trial. The perspective adopted for the valuation and costing of the intervention was that of the health-care payer; therefore, nonmedical costs (ie, patient time and travel costs, as well as costs related to lost productivity) were not included. All patients were followed for 1 year or until death, whichever occurred first, and the costing analysis was performed over the same time frame. The median survival in this patient population was 200 days (14% were alive at 1 year); therefore, no additional modeling of costs beyond the trial period was performed. Given that costs included in the analysis were incurred over the trial follow-up period (≤ 1 year), discounting was not performed.

Resources and Costs

The resources required to manage malignant pleural effusion was based on information documented on trial patients' case report forms. Resource use throughout the trial was recorded throughout the study period and divided into the following categories: (1) initial intervention procedures and hospital LOS (if required), (2) resources related to ongoing drainage, and (3) adverse events (summarized in Table 2).

Initial Intervention: Initial intervention costs consisted of baseline chest tube insertion costs plus hospital or day-case unit charges, depending on whether patients were treated as an inpatient or outpatient. Baseline insertion costs included chest tube insertion supplies, ultrasound provision, nursing time (1 h), physician time (1 h), and drainage (ie, if additional collection bottles were used for patients with high-volume fluid production). In the case of patients with an IPC, we included an additional cost for IPC education by a nurse (duration, 2 h). For patients undergoing talc pleurodesis, in addition to baseline insertion costs, we included costs related to the pleurodesis itself (ie, analgesia and the need for an additional pre-pleurodesis chest radiograph).

Ongoing Drainage: The total volume of pleural fluid drainage was recorded in both study groups. Patients with IPCs were given a logbook after insertion of their catheter in which they were asked to record how often they drained their IPC and the number of bottles required. The total number of bottles used during the follow-up period was then multiplied by the manufacturer's acquisition cost for the drainage bottle.

Adverse Events: Data for all adverse events were collected. A blinded reviewer (R. F. M.) determined if adverse events were related to the