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## How Much Does Management of an Asthma-Related Event Cost in a Malaysian Suburban Hospital?

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### ABSTRACT

**Background:** Patients with asthma need long-term management to maintain optimal control. In addition to routine maintenance, urgent visits and hospitalizations may be required, as these patients are prone to acute exacerbations. The aim of this study was to estimate the costs of maintenance and acute exacerbation managements in patients with asthma in a suburban public hospital in Malaysia. **Methods:** An activity-based microcosting approach was applied to estimate the unit cost of events from the hospital's perspective. First, activities and resources that were involved in each cost center were identified and valued against a suitable form of unit. Thereafter, the mean cost of each resource per event was calculated by dividing the product of the quantity of the resource used and the unit cost of the resource by the number of events. The mean cost per event was the sum of the cost of resources for all cost centers involved. The costs were expressed in 2014 US dollars (\$) and Malaysian Ringgit (RM).

**Results:** Data were collected from 15 maintenance, 20 acute exacerbation, and 50 hospitalization events. The mean ( $\pm$  SD) cost of maintenance management was \$48.04 ( $\pm$  10.10); RM154.68 ( $\pm$  32.52). The cost of acute exacerbation management in the Emergency Department was \$13.50 ( $\pm$  2.21), RM43.46 ( $\pm$  7.10); and in the medical ward, the cost was \$552.13 ( $\pm$  303.41), RM1777.86 ( $\pm$  976.98), per hospitalization event. **Conclusion:** The microcosting of management of asthma-related events provides more accurate estimates that could be used in local economic studies. However, its possible limited generalizability to other types of health care settings in Malaysia needs to be kept in mind.

**Keywords:** asthma, cost, exacerbation, microcosting.

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Asthma is a chronic respiratory disease that requires long-term management to maintain optimal control. Routine follow-up at the outpatient clinic is very much dependent on patients' asthma control status; that is, those who have poor asthma control will require more frequent clinic visits compared with those with good asthma control. Nevertheless, patients with asthma are prone to acute asthma exacerbations regardless of their asthma control status [1]. According to the National Health Morbidity Survey Malaysia 2006, among the surveyed patients with asthma (prevalence rate 4.5%), 19.7% and 10.1% of the patients reported visits to the Emergency Department (ED) and the hospital, respectively, in the past 12 months [2]. Up-to-date data were not available, but these numbers are expected to have increased with growing urbanization in this country in the past decade. In the Malaysian health care system, when an acute exacerbation cannot be managed by the patients themselves, an urgent visit to the ED with possible hospitalization becomes necessary. Hence, asthma is ranked as one of the most expensive chronic diseases in the world [3], as it requires high utilization of public health care resources. Information on resource utilization is important

to the health care provider [4] for health care budget planning, and yet there is very little information on the costs of asthma management in this country.

One method considered the gold standard for measuring health care resource utilization in terms of cost is the activity-based bottom-up microcosting approach [5]. This approach provides highly precise cost estimates, whereby it identifies each component of resource use and values it by using the bottom-up approach to obtain patient-level unit costs. Activity-based costing is a common variant of the bottom-up microcosting method. The key point of activity-based costing is to identify all activities that are the cost drivers in a cost center/resource. Previous asthma costing studies in Malaysia [6] did not report the cost per hospitalization for asthma and also did not describe their costing methods adequately enough to help assess the precision of the cost estimates, and different costing methods yielded different estimates [7,8], thus affecting the precision or the accuracy of the measured costs [9]. The current study aimed to use the activity-based costing of the bottom-up microcosting approach to measure the costs incurred in a suburban public hospital in Malaysia

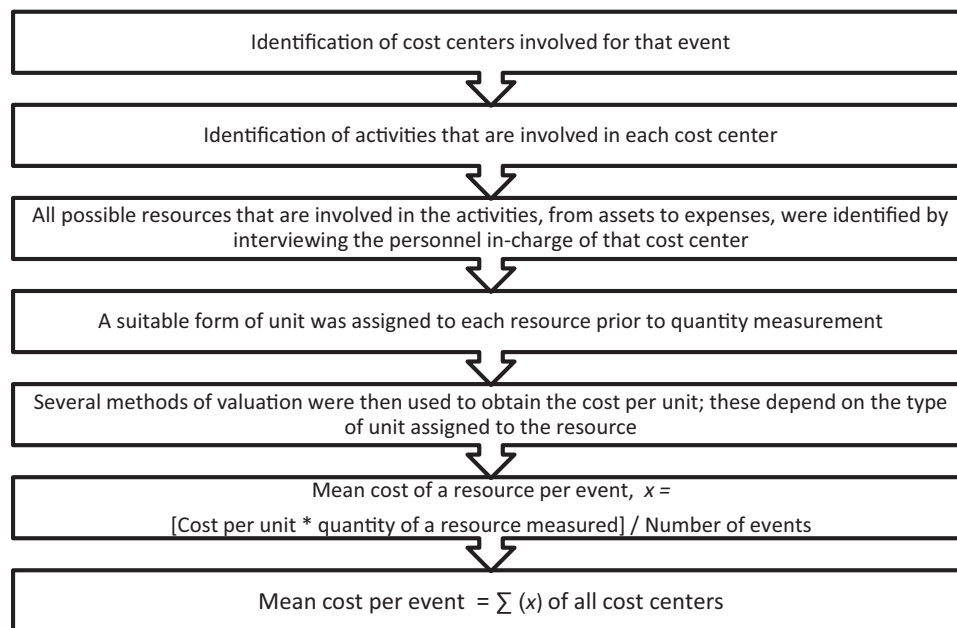
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**Figure 1 – The study flowchart.**

for a maintenance visit, an urgent visit to the ED, and hospitalization for asthma, from the hospital’s perspective. In Malaysia, the major health care provider is the Ministry of Health Malaysia, which is also the major health care payer under the universal health care system. It is thus appropriate to estimate the cost of managing these events from a public hospital perspective in this study. A glossary of terms used in this article is provided in [Appendix 1](#).

## Methods

### General

This observational study was conducted in a 548-bed suburban hospital in the state of Perak, Malaysia, during the month of October 2015. A minimum of 15 observations were made on patients over the age of 18 years visiting the respiratory clinic (which is held once a month) at the Physician’s Clinic (PC), Outpatient Pharmacy (OP), Ambulatory Pharmacy (AP), and ED. A sample size of 15 units of each activity was arbitrarily chosen because it was assumed that there would not be much difference in the duration of completing one unit of activity compared with another. However, 50 in-patient asthma cases (January to September 2015) were identified from the diagnosis written in the census book of four adult general medical wards. Thereafter, these records were retrieved from the Medical Records Unit of the hospital. The 50-record sample was chosen because a greater variability in the hospitalization costs was expected; admissions for asthma exacerbation could have many reasons, such as a treatment compliance issue or respiratory infection. These reasons could affect the duration of stay, the need of diagnostic tests, and prescription of drugs, among factors that contribute to variability in hospitalization costs.

Briefly, the study population from the PC cost center, nebulizing activity, and ward were patients with asthma. However, patients without asthma were also included as part of the study population from the OP, AP, and ED cost centers. It was assumed that the resources used for asthma and non-asthma cases in these cost centers would be similar. This assumption was made

because all patients were treated equally (using the same resources, including the time spent by personnel) in the pharmacy and in the treatment room of the ED. The overall methodology of this study is summarized in [Figure 1](#). The cost analysis was performed by using Microsoft Excel 2007 (Microsoft Corp., Redmond, WA). All costs were expressed as mean (SD) and were adjusted to 2014 US dollars (\$1 = Malaysian Ringgit 3.22) [10,11]. This study was approved by the Medical Research Ethics Committee of the Ministry of Health Malaysia (NMRR-12-372-11920).

### Cost Centers, Activities, and Resources Involved

The “cost center” is where the resources are utilized. For maintenance management of asthma, the cost centers are the PC and the OP, and the cost centers for acute management of asthma in the ED are the green-zone section of the ED and the AP. For reasons of data feasibility and accessibility, only the green-zone (non-life-threatening) section of the ED was used in this study. The medical ward is the cost center for hospitalization for asthma. Details of the activities involved in each cost center and the resources for each activity are provided in [Appendix 2](#).

### Quantity Measurement

The time spent to complete one unit of activity (rather than the activity itself) for each activity (except prepacking) by the personnel was measured. For example, the time spent to complete the registration for one patient was measured instead of the time spent on working at the registration counter. This method avoids the assumption that the personnel will work at the counter at all times. This assumption is biased, given that the personnel will have their downtime; moreover, the clinic may not run the whole day. Therefore, the time taken to complete one unit of activity was measured by summing the total duration (end time minus start time) of every predetailed task; this provided a collective description of the activity performed by the personnel per patient. All activities except nebulizing were continuously observed by an external observer—that is, “the external observer maintains the attention on the subject and continuously records the time taken to perform one or multiple tasks, implying that the action of recording is triggered by an action performed by the

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