

## Original Article

# The outcome of right-siting asthma patients to primary care providers

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**Abstract.** Right-siting chronic asthma care from acute care hospitals to primary care providers (PCPs) was an initiative undertaken at an institution in Singapore. This study aimed to evaluate the effectiveness of right-siting asthma patients from three different clinical settings. A retrospective study was conducted from January 2012 to December 2012. A total of 460 patients were right-sited to primary care providers (PCP). Of these, 392 (85.2%) were decanted to polyclinics and 68 (14.8%) to general practice (GP) settings. The asthma control test scores were significantly improved for patients who were followed up at the polyclinic within 12 months after being right-sited to the PCP ( $p < 0.001$ ). Out-patients had lower emergency department (ED) re-attendance rates compared to other referral sources ( $p < 0.001$ ) and in-patients had higher re-admission rates than other referral sources ( $p = 0.002$ ). Re-admission patients had a statistically significantly higher mean age of 55 than non-re-admission patients at 44 ( $p < .001$ ). Patients with prior ED attendance and hospitalization had higher rates of re-attendance and re-admission within a year ( $p = 0.001$ ,  $p < 0.001$ ). The risk of ED patients experiencing re-attendance at the ED within 12 months was 5 times that of out-patients ( $p < 0.001$ ). In conclusion, the employment of a right-siting coordinator (RSO) did provide better transition for patient care between acute hospital settings and PCPs. Although the single intervention of connecting patients to their PCPs with an appointment prior to discharge did not significantly improve patient compliance to follow-up care, it did appear to improve asthma control in patients who kept to their PCP appointments suggesting that PCP follow-up is effective in the improvement of long-term preventative care.

**Keywords:** Asthma, right-siting, primary care provider, health care utilization

### Introduction

The prevalence of asthma is on the rise globally. It has been reported that 300 million people are currently affected by asthma and by 2025 this number will reach 400 million [1]. Despite advanced therapies in asthma management, treatment of asthma remains common in the Emergency Department (ED). This reflects inefficient long-term disease control, which may be attributed to the haphazard scheduling of follow-up appointments, or lack thereof, with primary care providers (PCPs) after the first index ED visit.

Although the Global Initiative of Asthma (GINA) Guidelines highlights that the goal of treatment is to achieve and maintain asthma control for a prolonged period of time [2], this goal has not been realized for the majority of patients. In fact, a recent study in an ED at a tertiary hospital in Singapore reported that only 45% of patients discharged from the ED were given formal referral letters for follow-up with a PCP [3].

The lack of follow-up care from the primary care service contributed to poor asthma control, high financial burdens

and poor customer service [4]. Concerns about this situation stimulated concentrated effort towards a more structured transition of care for patients. Among the viable recommendations was one that suggested patients be linked to a PCP, with whom at least one appointment should be made prior to the patient's discharge from any given acute care setting [5]. This intervention was introduced in 2011, in which a dedicated right-siting coordinator (RSO) would link each patient with a PCP, according to the patient's preferences.

Subsequently, this study was conducted to evaluate the effectiveness of this single pilot intervention. The primary objective of this study was to measure and compare, at 6 months and 12 months, the follow-up rates of patients from three different hospital settings who were subsequently decanted to PCPs. The secondary objective of this study was to measure and compare, again at 6 months and 12 months, the emergency re-attendance and hospital re-admission rates of patients from three different hospital settings who were referred to PCPs.

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## Materials and Methods

### Role of right-siting coordinator (RSO)

A dedicated RSO was employed for the administration of right-siting initiatives of stable and chronic asthma patients from three different sites in an institution (ED, in-patient and out-patient) to the PCP in the community [General practitioner (GP) and polyclinics (OPS)]. In addition, the RSO oversaw and supported the planning process of identifying patients suitable for right-siting alongside clinicians. Follow-up appointment protocol was established as follows, in line with the GINA guidelines [2]:

- For patients discharged from the ED, a follow-up appointment would be scheduled within 1-2 weeks.
- For patients discharged as in-patients, a follow-up appointment would be scheduled within 1-2 months.
- For patients discharged as out-patients, a follow-up appointment would be scheduled within 3-4 months.

The RSO would prepare all relevant documents required during patient and family counseling, to facilitate the care transfer to GPs or OPSs, and vice versa, if necessary. She also maintained a master database of the patients who had been right-sited at 6 months and 12 months for audit and registry purposes.

### Telephonic follow-up data

All patients had a 10-minute telephone interview with the RSO 6 months and 12 months after the first index date of discharge from the institution. The objective of the interview was to confirm that the patient had kept to the follow-up appointment with the PCP. Compliance reschedules or defaults were only self-verified by the patient. PCPs were not contacted for verification.

A standardized telephone interview was conducted with each patient, to enquire about the patient's control of asthma using the ACT [6]. Other information obtained at 6 months and 12 months included the following: patient's follow up status, number of times the patient sought care for asthma in the ED, and number of times the patient was hospitalized for asthma.

### Study subjects

Retrospective medical records of asthma patients discharged to PCP between January and December 2012 were retrieved from the database for this study. Prior to conducting this study, the protocol was approved by the Institutional Review Board. The study was to include patients discharged from the ED, in-Patient and SOC.

Attending clinicians from these settings could discharge asthma patients to a PCP in the community for further follow-up and management of asthma. The PCPs could either be from a government OPS or a private GP. Patients discharged to an OPS were scheduled with follow-up appointments (date/time). In contrast, patients discharged to a GP were not given a specific date and time. This was because the majority of GP clinics in Singapore do not use an appointment system. Instead, patients discharged to GP clinics were advised to attend the assigned clinics according to the follow-up appointment protocol.

Prior to discharge to PCPs, each patient was equipped

with an individualized education and counseling session, due to the diversity of sites from which the patients were discharged (ED, in-patient and out-patient). These educations and counseling sessions were tailored according to each patient's educational needs and their inclination for counseling.

### Data collection

#### Demographic and health care utilization data

Patient demographics (age, gender and ethnicity), disposition status (OPS or GP), re-attendance, re-hospitalization incidents and default rates at 6 months and 12 months from the first discharge date, were retrieved for each patient through the hospital's electronic medical records system. Further information on re-attendance and/or re-hospitalization to other health care institutions was also retrieved from the system. Follow-up status to PCPs was provided by the patient, since the necessary data was not available via the electronic medical record system.

'Re-attendance' was defined as an ED revisit for asthma exacerbation within 1 year from the first discharge date (of a hospital visit that did not require admission). 'Re-admission' was defined as an ED revisit for asthma exacerbation within 1 year from the first discharge date (of a hospital visit that required admission). 'Default' was defined as a follow-up appointment that the patient had failed to attend.

#### Asthma control test (ACT)

Asthma Control Test (ACT) scores were assessed prior to patient discharge, as well as at 6 months and 12 months post-discharge, via telephone interviews. The ACT was a five-item questionnaire with a five-point scale that assessed asthma control. The questions assessed shortness of breath, nocturnal symptoms, interference with daily activities, and use of rescue medication over the past four weeks. The total ACT score indicated the effectiveness of asthma control for a given patient. The scores ranged from 5 (poor control) to 25 (complete control).

#### Statistical analysis

All statistical analysis was carried out using IBM SPSS Statistics version 19.0 (Armonk, NY: IBM Corp). For continuous variables, mean (SD) or median (IQR) were presented depending on the normality of the variables. Categorical variables were described as frequency (percentage). We compared the ACT score between on decant, 6 months and 12 months using Friedman test.

We assessed separately the relationship of ED re-attendance and hospital re-admission with respect to age, ethnicity, follow-up status, source of referral, ED visit in previous years and hospital admission before discharge, using t-test for continuous variables and chi-square tests for categorical variables. Multivariable logistic regression was conducted to assess which source of referral has lower ED re-attendance and hospital re-admission rate after the adjusted odds ratio. Continuous data was presented as mean and statistical deviation (SD). Two-sided tests were used, and the level of significance chosen was 0.05.

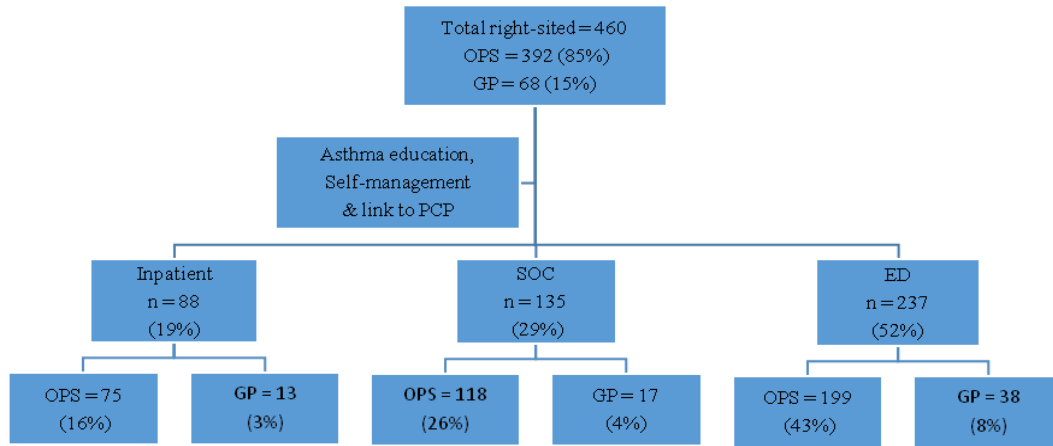


Figure 1 Recruitment of patient right-sited to primary care providers

**Results**

A total of 460 patients were right-sited to PCPs from January 2012 to December 2012. A retrospective data analysis was conducted using the variables collected from the database maintained by the RSO.

**Patient characteristics**

The disposition status of patients after being right-sited to the appropriate PCPs is presented in Figure 1. 392 (85%) were right-sited to OPS settings, and 68 (15%) were right-sited to GP clinics. 237 (52%) that were right-sited were from the ED setting. Baseline characteristics of the patient population are shown in Table 1. Patients right-sited from the ED were younger, with a mean age of 37 (SD 14), compared to Inpatients at 61 (SD 19) and SOCs at 52 (SD 19). 278 (60%) of those right-sited were female. The racial distribution of patients right-sited were as follows: Chinese 181 (39%), Malay 165 (36%), Indian 91 (20%), and others 23 (5%). Within the ED group, Malay patients (47%) outnumbered Chinese patients (27%).

**Measurement and comparison of follow-up rates at PCP**

Figures 2 and 3 depict the measurement and comparison of follow-up rates at 6 months and 12 months after patients had been right-sited to OPS and GP settings. The show rate in GP settings was 45.6% at 6 months. It was higher than the show rate in OPS settings (39.8%). There were no statistically significant differences (P=0.3687) found in both groups. However, long-term (12 months) follow-up monitoring showed that follow-up rates had decreased; instead, the number of patients lost to contact had increased.

The results at 12 months also showed that the patients right-sited to OPS settings had a higher rate of being referred back to the SOC (13.3%), compared to the patients right-sited to GP settings (7.3%). However, this difference was not statistically significant (P=0.1714). Patients right-sited to PCPs, regardless of whether it was to OPS or GP settings, showed significant improvement of ACT scores over the 12 months of monitoring (P< 0.001) (Table 2). Out of the 460

patients who were right-sited to PCPs, 3 died. Of the deceased, two were right-sited to the OPS, and the other to a GP clinic. The three patients are elderly, aged between 72 and 79. The causes of death were attributed to other illnesses.

**Health care utilization within 12 months post-discharge to PCP**

Apart from the three deceased patients, 102 (22.2%) had ED re-attendance and 45 (9.8%) were re-admitted within 12 months after being right-sited to their respective PCPs.

Factors associated with re-attendance and re-admissions within 12 months post-discharge were examined in Table 3. It was found that hospital re-admission rates were positively associated with older patients (55(21) vs. 44 (19) years, P<0.001). However, the age factor was not significant in patients who re-attended the ED. Malay patients were associated with higher ED re-attendance rates compared to patients of other ethnicities (P < 0.009). Patients right-sited from the SOC had lower ED re-attendance compared to those right-sited from the ED and In-patient units (P<0.001). Patients from In-patient showed higher re-admission rates that patients from SOC and ED (p=0.002) (Table 3). Previous ED attendance and hospital admissions were associated with a higher risk of subsequent ED re-attendance and hospital re-admission within 12 months. (P<0.001 and <0.001; P=0.001 and P<0.001). From the multivariable logistic regression analysis adjusted to patients discharged from the SOC, it is evident that the risk of ED re-attendance within 12 months, in comparison to patients discharged from the SOC was 5 times more likely for ED patients and 3 times more likely for in-patient patients (Table 4). Furthermore, compared to patients discharged from the SOC, patients discharged from In-patient settings were 3 times more likely to be re-admitted within 12 months (Table 4).

**Discussion**

**The follow-up rates at OPS or GP**

The instances of disconnected follow-up care to primary

TABLE 1  
DEMOGRAPHIC OF THE STUDY POPULATION

Variables	Total (n=460)	In-patient (n=88)	SOC (n=135)	ED (n=237)	p-value
Age (Year), Mean (SD)	46(19)	61 (19)	52 (19)	37 (14)	< 0.001
Female, n (%)	278(60)	64 (73)	82 (61)	132 (56)	0.02
Ethnic					<0.001
Chinese, n (%)	181(39)	36 (41)	80 (60)	65 (27)	
Malay, n (%)	165(36)	32 (36)	22 (16)	111 (47)	
Indian, n (%)	91(20)	18 (21)	22 (16)	51 (22)	
Others, n (%)	23(5)	2 (2)	11 (8)	10 (4)	

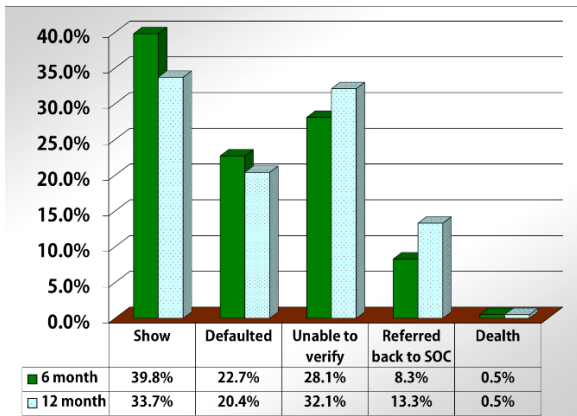


FIGURE 2 Measurement and comparison of follow up rates in outpatient service setting

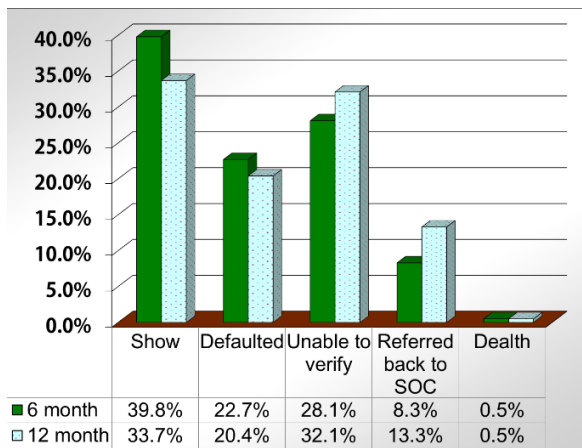


FIGURE 3 Measurement and comparison of follow up rates in general practitioners setting

TABLE 2  
ASTHMA CONTROL TEST (ACT) SCORE CHANGE OVER 1 YEAR

Variables	On decant	6 months	12 months	p-value
ACT, Median (IQR)	20(18-23)	24(20-25)	24(21-25)	< 0.001
ACT, OPS, Median (IQR)	20(18-23)	24(20-25)	24(21-25)	0.001
ACT, GP, Median (IQR)	20(18-23)	24(20-25)	23(20-25)	0.03

care from acute care institutions to the appointed PCP. The majority of patients discharged from the acute care settings were scheduled for follow-up appointments with PCPs.

Both retrospective and randomized controlled studies recommended this method as an effective approach, albeit a

traditional and tedious one [7-10]. Using this patient-centered approach, patients were successfully connected to their preferred PCPs (OPS 85%; GP 15%). This is unlike the results in a comparable study where 55% of asthma patients discharged from the ED were lost to follow-ups [3]. Based on the appointments that were successfully scheduled, it is reasonable to conclude that the RSO played a critical role in scheduling follow-up appointments and facilitating the transition of care.

While this focused initiative of connecting patients to their PCPs with an appointment produced measurable results, it is significant that overall compliance rates to follow-up appointments remained low (OPS 39.8%; GP 45.6%). Similarly, many other studies have demonstrated poor patient compliance, reporting follow-up rates from 22% to 52% following an asthma ED visit [11-14]. Although a number of studies have reported high rates of compliance (60-77%) [5, 9], there were other variables involved, including co-morbid medical conditions and interventions in the ED setting.

Comparison of follow-up compliance rates between published studies was difficult to conduct due to confounding factors such as demographics of study populations and socioeconomic status [5]. Other variables include the acuity of conditions, intervention methods, and the different departments from/to which the patients were right-sited.

Despite having the RSO secure follow-up appointments to bridge the gap for patients to seek long-term preventive care, it did not lead to increased follow-up rates with the OPS and GP. One possible explanation for this undesirable result might be that there were other complex psychological, social, financial and medical issues that kept patients from keeping to their scheduled appointments [5].

While this study did not cover aforementioned issues, it is reasonable to assume that fixed, scheduled appointments would have their own flaws. For example, patients who were linked to OPS settings were given fixed, scheduled appointments, whereas patients linked to GP settings were told to follow up within a stated time period (this was due to the lack of an advanced appointment system in GP settings). At 6 months, the show rate at the GP was indeed greater (45.6%) than the show rate at the OPS (39.8%), but this difference was not statistically significant (P= 0.3687). Nevertheless, a reasonable explanation could be that fixed, scheduled appointments were disagreeable to patients, who were not able to exert immediate control over the scheduling of dates and/or times. In contrast, patients who were instructed to schedule their own appointments within a stated period of time may have been more amenable given the flexibility of specific date and/or time of appointment. Another contributing factor may be the fact that GP clinics were operational even after office hours, while OPS settings were only operational during office hours. Such matters of convenience and flexibility would likely have contributed to patient adherence to follow-up recommendations [5]. This observation suggests that follow-up appointments should take into consideration the patient's perceived convenience and flexibility in scheduling said appointments.

Another possible barrier to patient compliance was the

TABLE 3  
HEALTH CARE UTILIZATION WITHIN 12 MONTHS POST DISCHARGED TO PRIMARY CARE PROVIDERS

Variables	ED attendance			Hospital admission		
	Yes (n=102)	No (n=355)	p-value	Yes (n=45)	No (n=412)	p-value
Age (years), mean (SD)	45 (19)	46 (20)	0.717	55 (21)	44 (19)	<0.001
Ethnic			0.009			0.768
Chinese, n (%)	29(28.4)	150 (42.3)		15 (33.3)	164 (39.8)	
Malay, n (%)	51 (50.0)	114 (20.3)		20 (44.4)	145 (35.2)	
India, n (%)	18 (17.6)	72 (32.1)		7 (15.6)	83 (20.1)	
Others, n (%)	4 (3.9)	19 (5.4)		3 (6.7)	20 (4.9)	
Source of referral			<0.001			0.002
Inpatient, n (%)	21 (20.6)	64 (18.0)		17 (37.8)	68 (16.5)	
SOC, n (%)	14 (13.7)	121 (34.1)		11 (24.4)	124 (30.1)	
ED, n (%)	67 (65.7)	170 (47.9)		17 (37.8)	220 (53.4)	
Follow up status post discharge			<0.001			<0.001
OPS, n (%)	22 (21.6)	107 (30.1)		9 (20.0)	120 (29.1)	
GP, n (%)	2 (2.0)	24 (6.8)		0 (0)	26 (6.3)	
Default, n (%)	9 (8.8)	82 (23.1)		3 (6.7)	88 (21.4)	
Referred back to SOC, n (%)	39 (38.2)	18(5.1)		23 (51.1)	34 (8.2)	
Unable to verify, n (%)	30 (29.4)	124 (34.9)		10 (22.2)	144 (35.0)	
Previous 1 year ED visit before discharge, Yes, n (%)	53 (52.0)	63 (17.7)	<0.001	23 (51.1)	93 (22.6)	<0.001
Previous 1 year hospital admission before discharge, Yes, n (%)	20 (19.6)	28 (7.9)	0.001	17 (37.8)	31 (7.5)	<0.001

patient's perception of the severity of their asthma [15]. If the patient underestimated the severity of their condition, or overestimated their own resistance to further asthmatic attacks, it is reasonable to assume that they would not fully comprehend the importance of regular, long-term follow-up.

To address this barrier, telephonic coaching can be used to improve patient compliance to follow-ups. In this study, even though telephone calls were indeed made by the RSO at 6 months and 12 months respectively, the purpose of these calls were primarily for outcome-monitoring and auditing, rather than addressing patient concerns. Ideally, the telephone calls should be executed in a timely fashion, either before or after the patient's scheduled appointment date. These calls would directly address the patient's barriers to keeping their appointments, and to check the status of their experience in coping with the disease at home. Bidirectional interaction such as this would enforce mutual trust that could result in higher show rates with PCPs and improve overall patient satisfaction [8, 16].

In this study, long-term follow-up rates to PCPs decreased over time and, at 12 months, default rates were markedly increased in both groups. Similar results had been reported in other studies [8, 13]. Using different models of care delivery did improve follow-up rates in the first 15 days, but they did not overcome the barriers of long-term follow-up after 16 days to 6 months. This result suggests that the single intervention of RSO connecting patients with follow-up appointments to PCPs may be inadequate. A more effective model of care delivery should be explored to improve patient compliance to follow-up appointments.

### Factors Affecting Health Care Utilization

The reported rates of ED re-attendance (22.2%) and re-admission (9.8%) within 12 months were a combined measure from the three different sites. As such, this could have distorted the overall results of the study. The acuity of condition also differed from patient to patient, which may have contributed to misrepresentation about the effectiveness of RSO intervention to reduce health care utilization.

Several factors were found to be associated with said health care utilization. Firstly, it was found that re-attendance and hospital re-admission were linked to patients who had already experienced ED attendance and hospital admission within the preceding 12 months. It has been reported that the reuse of acute care settings may be associated with poorly controlled asthma, multiple comorbidities, non-compliance, socio-economic factors, and defaults on follow-ups for ongoing preventive care [17]. Secondly, the findings reveal that hospital readmissions positively correlated to age (55 vs 44 years). Asthma in the elderly population is complicated not only by co-morbid diseases, but also by pathophysiological mechanisms, various psychosocial effects of aging, and the high mortality rate that is natural for ageing [18]. This inference is supported by the fact that all three deceased patients in this study died of co-morbid conditions. Ideally, the elderly asthmatic patient should be given facilitated referral to a specialist clinic from the ED and In-patient units to improve their long-term asthma care. This would allow the patient to experience a smoother transition of care from acute care to

TABLE 4  
MULTIVARIABLE ANALYSIS OF RE-ATTENDANCE AT ED AND  
HOSPITAL RE-ADMISSION WITHIN 12 MONTHS

Variables	ED attendance			Hospital admission		
	OR	95% CI	p-value	OR	95% CI	p-value
Source Of Referral						
Inpatient, n (%)	2.9	1.3-6.9	0.013	2.7	1.0-6.7	0.041
SOC, n (%)	REF			REF		
ED, n (%)	4.9	2.3-10.0	<0.001	1.1	0.4-2.6	0.903

Note: Multivariable model adjusted for follow up status post discharged, previous 1 year ED visit before discharge or previous 1 year hospital admission before discharge accordingly (data not shown).

long-term support from PCPs.

Thirdly, this study found that the risk of re-attending the ED within 12 months, in comparison to patients discharged from the SOC, was 5 times more likely for ED patients, and 3 times more likely for In-patient patients (Table 4).

Furthermore, compared to patients discharged from the SOC, patients discharged from In-patient settings were 3 times more likely to be readmitted within 12 months (Table 4). In other words, the results showed that patients right-sited from the SOC were better able to maintain asthma control. We believe that follow-ups in the SOC provided more time for patients and healthcare providers to monitor and optimize treatment, review inhaler techniques, and provide education and counseling for patients [8]. Patients discharged from the ED and In-patient units had shorter contact time with healthcare providers compared to patients from the SOC. Hence, physicians would have a limited time period to adjust medications and monitor the patient's asthma control. Additionally, educating patients during exacerbation could also be challenging in ED and In-patient settings. Thus, lack of interaction due to physical and mental exhaustion could have compromised the patient's ability for effective asthma control [19].

SOC follow-ups may serve as a good platform to ensure that patients are sufficiently educated and counselled on self-management, prior to being right-sited to PCPs. This in turn would lead to better care transition, potentially decreasing ED re-attendance and hospital re-admissions [20, 21].

### Long-Term Asthma Control

Telephone call follow-ups within 12 months post-discharge recorded significant improvement of ACT scores in patients who followed-up with their PCPs. The overall median ACT score was 24. Taking into consideration the diversity of settings from which the patients were right-sited, there was still significant improvements of patients' ACT scores in 12 months. This result reinforces the importance of ongoing long-term preventive care.

### Limitations

This study was conducted in a single acute hospital. Thus, these results may not be translatable to other settings. Data collection in this study also excluded patients' comorbidities, severity of asthma, psychosocial issues, treatment compliance, and reasons for defaults to follow-up care. Such data may affect the results of this study and, if

collected, may provide further insight to the reasons behind the recurrent issue of healthcare.

### Conclusion

This study was a pilot investigation into the effectiveness of employing an RSO to link asthma patients from the ED, In-patient and Out-patient units, to their respective PCPs for ongoing preventative care. The results showed that the employment of an RSO did provide better transition for patient care between acute hospital settings and PCPs. Although the single intervention of connecting patients to their PCPs with an appointment prior to discharge did not significantly improve patient compliance to follow-up care, it did appear to improve asthma control in patients who kept to their PCP appointments. This suggests that PCP follow-up is effective in the improvement of long-term preventative care.

As a result of this study, one suggestion was that the responsibilities of an RSO should be extended to include timely, telephone calls to the patient, either before or after the patient's scheduled appointment date. This measure was recommended in order to address the patient's potential barriers in keeping to their appointments, and to check the status of their experience in coping with the disease at home. This could potentially increase patient compliance with follow-up care.

It is advised that future research should focus on the implementation of this RSO strategy and consider its effectiveness post-implementation at health care institutions.

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### Conflict of Interest

The authors declare no conflicts of interest.

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