Standard *versus* patient-centred asthma education in the emergency department: a randomised study

S. Smith*, C. Mitchell[#],[¶] and S. Bowler[+]

ABSTRACT: High re-attendance rates are common after asthma emergency department (ED) care. Inadequate patient education has been cited as a potential cause of re-attendance and the optimal format of education is uncertain. The present study aimed to compare the effectiveness of patient-centred education (PCE) and standard asthma patient education on ED re-attendance.

A randomised controlled trial was conducted at two inner-city Australian teaching hospitals' EDs, where patients received either standard patient education (SPE) or PCE. Both groups received a six-topic curriculum. However, PCE patients reordered the topics according to their own priority and thus controlled the order of education.

In total, 146 adult patients presenting to EDs with acute asthma were enrolled. After 4 months, ED re-attendance decreased from 22 to 12% in the PCE group and remained unchanged in the SPE group (between group odds ratio 0.4, 95% confidence interval (0.2–1.1)). In 78 patients discharged after ED care, the PCE group had fewer re-attendances after 4 and 12 months (0.3 (0.1–0.9) and 0.3 (0.1–0.8), respectively). PCE patients with no general practitioner care in the preceding 7 days had fewer re-attendances after 4 and 12 months (0.1 (0.0–0.7) and 0.2 (0.0–0.6), respectively). A trend of better asthma control was evident, with a reduction in activity limitation.

In conclusion, patient-centred education offers promise as a brief education process in the emergency department. However, a large multicentre trial of patient-centred education is required.

KEYWORDS: Asthma, emergency department, patient education

Asthma mortality has declined in recent years even though asthma morbidity continues to affect the quality of life of individuals with asthma [1, 2]. This is evident from the number of people with asthma presenting to emergency departments (EDs) [3–5]. Asthma patients' re-attendance rates after receiving ED care can be as high as 17% [6, 7].

Numerous studies have found that people with acute asthma receive care that is inconsistent with asthma management guidelines, including inadequate discharge planning and education [6, 8–14]. Some studies of patients with acute asthma have focused interventions on improving primary care follow-up *via* telephone reminders [15] and primary care-based education [16], which have shown very little or no improvement in patient behaviour or asthma outcomes.

Patient education has been described as an essential component of asthma management, with clinical guidelines providing the basis for both clinical management and education curricula [17]. Prevention of further episodes of acute asthma is a focus of patient education, although to what extent it is effective remains unclear. Delayed education has shown limited positive outcomes. A brief, opportune, educational intervention in the ED may be a useful adjunct to current ED care and would be consistent with international and national guidelines [2, 18]. However, asthma education studies poorly describe the teaching and learning principles underpinning the asthma education process [19].

Unlike previous studies, the current study sought to examine the process of educating patients through a focus on teaching and learning behaviour. The method used a learner-centred approach [20], as the concepts were congruent with the central tenets of patient-centred care [21]. Standard patient education (SPE) differs from a learner-centred approach as it usually starts with pathophysiology and ends with the

importance of ongoing review [22, 23]. Standard education is often the way health professionals are educated. The present authors aimed to compare patient-centred education (PCE) with SPE, looking at the subsequent effects on the number of further ED attendances and asthma control. The same curriculum, based on a clinical guideline, was used for PCE and SPE.

MATERIALS AND METHODS

Study design

The present study was a prospective randomised controlled trial of two methods of patient education for people with asthma attending an ED. PCE [19] was underpinned with learner-centred principles, while SPE represented the traditional method of patient education. The primary aim of PCE was a reduction in ED re-attendance rates after 4 and 12 months. The secondary aim was to improve asthma control. Asthma control was evidenced by the patient's symptoms and reliever medication use in the 7 days prior to the ED attendance and at an outpatient department (OPD) visit 4–6 weeks after initial presentation. Ethical clearance was obtained from participating hospitals (Princess Alexandra Hospital and Mater Adult Public Hospital, Brisbane, Australia) and the Queensland University of Technology (Brisbane, Australia) Ethics Committee.

Study setting and population

The present study was conducted at two large teaching hospitals in Brisbane, Australia, from August 2001 until August 2002. Adult patients arriving at the ED with an acute exacerbation of asthma were invited to participate after medical clearance was given by the attending physician.

To be eligible, patients had to have been diagnosed with asthma prior to this presentation, aged >18 yrs, able to read and write English and have no other concurrent respiratory medical condition. Patients were excluded from the study if deemed too ill to participate by the medical officer and/or required intensive care medical treatment. Case notes were used to confirm the participant's eligibility and to exclude patients with other respiratory diseases and conditions that cause dyspnoea.

Study protocol

The procedures involved in the concealed allocation of patients to the study are outlined in table 1. Patients were medically managed prior to contact with the researcher. After giving their consent to the study, each of the 146 patients completed a questionnaire and placed it in a sealed envelope. Patients were randomised by their day of birth, with odd days receiving the intervention of PCE (n=68) and even days being assigned to the control group of SPE (n=78). The education was given to patients during their ED presentation. Staff at both EDs were blind to the randomisation process, as there was no notification of group assignment in the patient's chart. Only the researcher and the patient were present when the education was given.

Intervention

The asthma education protocol comprised a curriculum commonly used nationally and internationally [17, 22–24]. The curriculum for both groups was primarily based on a clinical guideline known as the Australian Six Step Asthma Management Plan (table 2).

The control group receiving SPE commenced with step 1 (asthma pathophysiology) and progressed sequentially through to step 6 (educate and review; table 2). The study intervention required the PCE participants to prioritise the six asthma curriculum steps according to their perceived need, and patients were educated accordingly so that the topic most important to them was covered first. The PCE process was underpinned by the self-determination theory, which emphasises autonomy, competence and relationship support. A review of this theory of human motivation in learner-centred education has been reported elsewhere [19, 20, 25]. The PCE intervention also required participants to respond to two open-ended questions: ''What is the most important issue for you at the moment?'' and ''What is the most important asthma issue for you at the moment?''

Each education session took ~20 min to complete. The PCE sessions lasted an additional 5–10 min as the educator addressed the patient's issues derived from the two open-ended questions. For both groups, an Asthma Foundation leaflet was given to patients to support the verbal advice of the educator and to take home for future reference. The leaflet conveyed similar information to the asthma education curriculum. One clinician (S. Smith) educated all the patients.

Measurements

Demographic, clinical and asthma control data were collected at the time of attending the ED (phase 1) and at the OPD follow-up appointment 4–6 weeks later (phase 2). Patients attending the follow-up OPD were subsequently educated again according to the ED randomisation. Participants' attendances at the ED in the 12 months prior to the asthma education intervention were recorded through self-report and secondary care audit data. Re-attendance information was collected through hospital records 4 and 12 months after phase 1 (fig. 1).

TABLE 1	Procedures in concealed allocation of patients to education groups

Step	Procedures
1	Patient arrives at emergency department and is triaged, researcher is notified by phone of the potential participant and travels to hospital
2	Patient is medically managed, stabilised and their chart checked by medical staff; medical officer grants permission for researcher to see patient
3	Patient is given study information then invited to participate; consent form is signed, date of birth checked and questionnaire given to patient for completion
4	Patient educated after completion of questionnaire, patient's chart indicates asthma study without information on group assignment; outpatient appointment date and time given to patient and recorded in chart

TABLE 2	The components of the asthma education curriculum as related to the six steps of the Australian Asthma Management Plan (AAMP)	
Step	AAMP	Asthma education curriculum
1	Identification of the high-risk patient: assess severity	What is asthma and how do I know I have it?
2	Achieve best lung function	How to achieve my best lung function
3	Maintain best lung function: avoid and identify trigger factors	How to stay well and identify and avoid trigger factors
4	Maintain best lung function: optimise medication programme	How to stay well through my medications
5	Develop an action plan	What is an action plan and how do I use it to help my asthma?
6	Educate and review regularly	How often do I need to have education and see the doctor?

Asthma control was measured using the asthma control questionnaire (ACQ) by JUNIPER *et al.* [26]. This validated method records the symptoms from the previous 7 days, along with β_2-agonist use. Asthma control data were collected at the time of ED attendance and again 4–6 weeks later in the OPD. Participants completed the questionnaire independently. Patients were educated on completion of the questionnaire.

Statistical analysis

All analyses were hypothesis driven and the two primary outcomes of interest were ED re-attendances and asthma control. Paired t-tests, ANOVAs and ANCOVAs were used to compare means of data that were normally distributed. The McNemar test was used for repeat measures of categorical data. In analyses of categorical data with small samples, statistical associations were assessed using the Fisher exact test. For previous admission and new admission data, the Wilcoxon test (nonparametric) was used to test the significance of differences between two related samples, while the Mann–Whitney U-test was used to test for differences between the control and intervention groups. Odds ratios (OR) were calculated, with 95% confidence intervals (CI) being reported. Logistic regressions were undertaken to determine any difference between subgroups, such as those that did or did not attend a secondary care medical OPD follow-up appointment.

RESULTS

Study population

In total, 148 adults with acute asthma who sought ED care were invited to participate in the study (fig. 1). Only two potential participants declined. The mean age was consistent with other asthma studies [22, 23, 27].

However, the study cohort had higher levels of formal education and lower levels of income than other study cohorts; 49.2% had an income <AU$20,000, while only 8% described themselves as unemployed. Despite the low income levels in comparison to the average Australian income (AU$55,000), a quarter of the study population stated they had private health insurance. Before ED presentation, participants in both education groups had similar prior ED attendances (table 3).

Topic prioritisation, patient and asthma issues

Many of the patients in the PCE group chose a different order for the asthma education topics, compared with the standard curriculum (table 2; p≤0.001). At the time of phase 1 ED presentation, the PCE group's topic order followed a pattern of step numbers 3, 2, 4, 5, 6 and 1. During the OPD phase of the study, the patients' prioritisation changed in order of importance to steps 4, 3, 2, 5, 6 and 1. Also, PCE responses to the two open-ended questions in the ED generated a number of patient and asthma issues. These responses differed slightly to those expressed a number of weeks later in the OPD (table 4).

Primary outcome: re-attendance

The SPE group had no reduction in ED re-attendance rate (23%) 4 months after receiving education in the ED. In contrast, the PCE group had halved the frequency of re-attendance to 12%. The between group comparison (n=146) of these differences was not statistically significant (OR 0.4; 95% CI (0.2–1.1)). However, when controlling for general practitioner
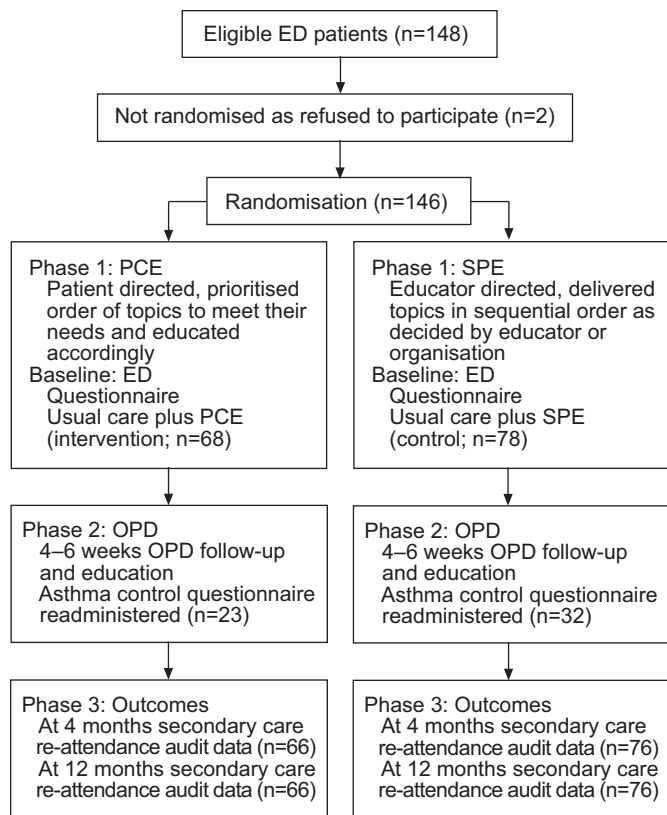
FIGURE 1. Summary of participant flow, numbers and timing of randomised assignment, interventions and data collection points. ED: emergency department; PCE: patient-centred education; SPE: standard patient education; OPD: outpatient department.

Eligible ED patients (n=148)

Not randomised as refused to participate (n=2)

Randomisation (n=146)

Phase 1: PCE
  Patient directed, prioritised order of topics to meet their needs and educated accordingly
Baseline: ED
  Questionnaire
  Usual care plus PCE (intervention; n=68)

Phase 1: SPE
  Educator directed, delivered topics in sequential order as decided by educator or organisation
Baseline: ED
  Questionnaire
  Usual care plus SPE (control; n=78)

Phase 2: OPD
  4–6 weeks OPD follow-up and education
  Asthma control questionnaire readministered (n=23)

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  4–6 weeks OPD follow-up and education
  Asthma control questionnaire readministered (n=32)

Phase 3: Outcomes
  At 4 months secondary care re-attendance audit data (n=66)
  At 12 months secondary care re-attendance audit data (n=66)

Phase 3: Outcomes
  At 4 months secondary care re-attendance audit data (n=76)
  At 12 months secondary care re-attendance audit data (n=76)

TABLE 3 Demographic and clinical phase 1 comparison of emergency department (ED) patients with acute asthma in standard patient education (SPE) and patient-centred education (PCE) groups			
	SPE	**PCE**	**p-value**
Subjects n	78	68	
Demographics			
Age yrs	(31) 33.9±14.1	(29.5) 33.6±13.6	0.89
Female	55	57	0.75
Single marital status	49	40	0.89
Education to Year 12 or above	73	67	0.94
Income <AU$20000	50	48	0.99
Occupation			0.53
Employed	69	52	
Unemployed	5	11	
Student	8	11	
Clinical profile			
FEV1 % pred			0.82
90–100%	4	12	
70–89%	18	16	
50–69%	29	18	
<50%	49	54	
Previous ED attendance	20	22	0.84
Self-reported prior hospital admission	42	42	1.00
Ambulance use	24	28	0.49
Attendance to a GP within the previous 7 days	21	33	0.04[*]
Time of attendance at ED			0.45
17:00–07:59	57	54	
08:00–16:59	43	46	
Admission to hospital	49	39	0.35
Peak flow monitoring	13	17	0.52
Symptom scoring	0.0	2	0.27
Length of time since diagnosis yrs	19.6±10.4	20.2±13.5	0.75

Data are presented as (median) mean±SD, % or mean±SD, unless otherwise stated. FEV1: forced expiratory volume in one second; % pred: % predicted; GP: general practitioner. *: $p < 0.05$, indicating significant difference between groups.

(GP) differences at baseline (phase 1), PCE patients had fewer re-attendances (F-statistic with one degree of freedom ($F_{(1)}$) 4.84, $p=0.03$). In total, 104 patients had not seen their GP in the 7 days prior to seeking care at the ED. In this subgroup, those randomised to PCE had significantly fewer re-attendances than the standard group ($p=0.01$).

Re-attendance rates did not differ for the 55 patients who received additional education in the OPD at 4 ($p=0.68$) and 12 months ($p=0.96$). However, when follow-up secondary care and prior care by the GP was controlled for, the PCE patients had fewer re-attendances than the control group ($F_{(1)}$ 5.0, $p=0.03$).

For 78 patients who were treated, educated and discharged from the ED (not admitted to a hospital ward), the PCE group had significantly fewer re-attendances at 4 and 12 months (OR 0.3, 95% CI (0.1–0.9) and OR 0.3, 95% CI (0.1–0.8), respectively;

TABLE 4 Most important patient and asthma issues from two open-ended questions, at the time of attending the emergency department (ED) and outpatient department (OPD) follow-up		
	ED	**OPD**
Most important issues	Employment issues	Staying healthy
	Financial pressures	Lifestyle issues
	Family responsibilities	Education and employment obligations
	Relationship issues	Legal and financial concerns
Most important asthma issues	Elimination of symptoms	Controlling asthma
	Prevention	Planning for future attacks
	Controlling asthma	Side-effects of medications
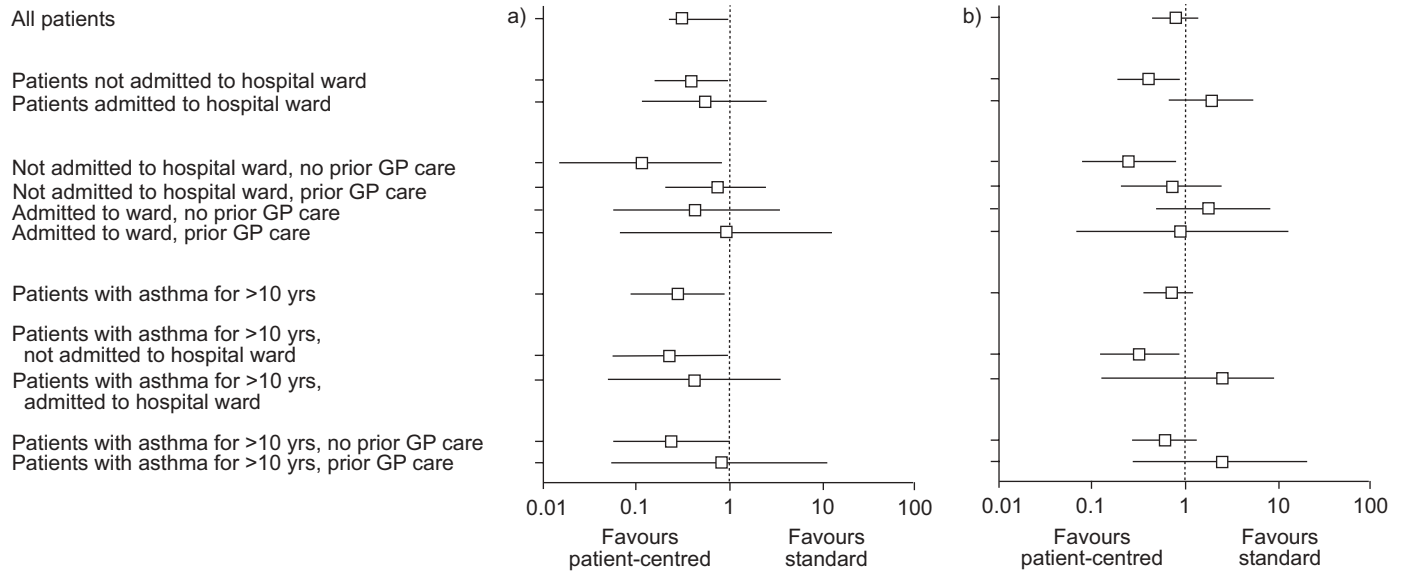
FIGURE 2. Re-attendance to the emergency department of all patients at a) 4 months and b) 12 months after phase 1 education. Data are presented as odds ratio (□) and 95% confidence interval (——). GP: general practitioner.

fig. 2). Furthermore, in this patient subgroup of those who also had not received recent GP care (n=63), the PCE patients were less likely to re-attend (0.1 (0.0–0.7) and 0.2 (0.0–0.6) after 4 and 12 months, respectively; fig. 2).

Additionally, people who had been diagnosed with asthma for >10 yrs also appeared to benefit from the PCE process. These patients had fewer ED visits within 4 months of being educated, although this was not sustained until 12 months (0.2 (0.1–0.9) and 0.3 (0.3–1.6), respectively; fig. 2).

In the present study, forced expiratory volume in one second (FEV_1) values were utilised to assess levels of acute asthma severity. Asthma severity was not associated with having seen a GP in the 7 days prior to presenting to the ED (p=0.57) nor with hospital admission (p=0.14).

Secondary outcome: asthma control

Asthma control was reported in two formats: first with all seven questions of the ACQ (symptoms, β_2-agonist use and FEV_1) and secondly with six questions pertaining to symptoms and β_2-agonist use (table 5).

Asthma control in all 55 patients improved between the ED (phase 1) and OPD follow-up (phase 2). However, when asthma control group differences at time of entry to the study were controlled for, a trend towards the PCE group gaining better control can be seen ($F_{(1)}$ 2.13, p=0.13). More specifically, the SPE group reported more activity limitation, with the PCE having a greater mean change difference that was significant between groups (p=0.03).

Overall, the mean difference between educational groups from phase 1 (ED) and phase 2 (OPD) confirms a trend of better asthma control for the PCE group (table 5). In the subgroup of 40 patients discharged from the ED, patients receiving the PCE intervention reported better asthma control (all criteria mean difference -6.59, 95% CI (-13.90–0.70)) and fewer symptoms (mean difference -6.55, 95% CI (-13.33–0.22)). The high number

of patients that did not attend the OPD medical follow-up appointment meant that comparisons using asthma control as an outcome were limited. In an analysis that included only the 55 patients that had full follow-up, there was a nonsignificant positive effect of the PCE (p=0.13). To carry out an intention-to-treat (ITT) analysis, asthma control was modelled using baseline demographic data (age, sex, occupation, education level and income level) and asthma control at ED presentation from patients with complete data. Missing values for asthma control at follow-up were imputed using this model; imputed and observed values were used in the ITT analysis, resulting in a nonsignificant positive effect of PCE (p=0.31).

Limitations

Studies undertaken in the ED are inherently difficult, with competing priorities for patients and health professionals. To overcome this difficulty, one researcher educated all patients involved in the study, which introduced a potential bias. By using the same curriculum for both groups and the researcher ensuring, in the most part, that the same words were used for each topic, irrespective of the assigned education group, the potential bias was reduced. Asthma emergency presentations during the data collection period may have been affected due to unusually mild summer and winter seasons, which could have decreased the asthma control scores. More patients in the control SPE group than in the PCE group returned to the OPD and received education, which could have limited the impact of the PCE intervention in reducing re-attendances.

There was a potential for contamination in patients who were admitted to a hospital ward because asthma education forms usual in-patient care at both study hospitals. Although the researcher was usually on call 24 h·day^{-1} 7 days·week^{-1} over the 12-month study period, there were some days when the researcher was not available. On average, the researcher was off call for one weekend in three, during which time potential study participants were not given the opportunity to participate.

TABLE 5	Asthma control questionnaire at phase 1 and phase 2						
	SPE			**PCE**			**Mean change difference between groups p-value**
	Phase 1 **ED**	**Phase 2** **OPD**	**p-value**	**Phase 1** **ED**	**Phase 2** **OPD**	**p-value**	
Symptoms							
All	2.88 ± 0.39	1.37 ± 0.43	<0.01	2.83 ± 0.50	1.12 ± 0.48	<0.01	0.09
Nocturnal waking	2.77 ± 1.47 (75)	1.03 ± 1.09 (32)	<0.01	2.92 ± 1.91 (63)	1.13 ± 1.00 (23)	<0.1	0.27
Morning symptoms	2.76 ± 1.45 (76)	1.34 ± 1.31 (32)	<0.01	2.81 ± 1.68 (63)	0.91 ± 1.04 (23)	<0.01	0.11
Activity limitation	2.68 ± 1.53 (76)	1.44 ± 1.50 (32)	0.04	2.61 ± 1.78 (62)	0.87 ± 1.04 (23)	<0.01	0.03*
Shortness of breath	3.54 ± 1.32 (76)	1.78 ± 1.53 (32)	<0.01	3.49 ± 1.66 (63)	1.78 ± 1.20 (23)	<0.01	0.34
Wheeze	2.64 ± 1.26 (76)	1.25 ± 1.04 (32)	<0.01	2.32 ± 1.38 (63)	0.91 ± 0.84 (23)	<0.01	0.39
β_2-agonist use	3.54 ± 1.78 (74)	2.06 ± 1.69 (31)	<0.01	3.10 ± 1.91 (60)	1.57 ± 1.08 (23)	<0.01	0.35
FEV$_1$ % pred	4.68 ± 1.57 (72)	1.60 ± 1.93 (25)	<0.01	4.49 ± 2.00 (61)	1.24 ± 1.75 (21)	<0.01	0.69
All criteria	3.17 ± 0.47	1.49 ± 0.56	<0.01	3.20 ± 0.46	1.21 ± 0.52	<0.01	0.12

Data are presented as mean $\pm$ SD (n), unless otherwise stated. SPE: standard patient education; PCE: patient-centred education; FEV$_1$: forced expiratory volume in one second; % pred: % predicted. *: $p<0.05$, indicating significant difference between groups. All variables were rated on a 0–6 scale where 0=no symptoms, normal FEV$_1$ % pred and minimal β_2-agonist use.

A number of participants (61.8%; PCE=66%; SPE=58%) did not attend their OPD appointment despite utilisation of a number of reminder strategies previously reported to be successful [28]. These strategies included making the appointment at the time the patient presented to the ED and contacting the patient by telephone the night before their appointment. However, the present return rate to the OPD was consistent with other public hospital asthma studies [29, 30]. Analysis of data indicated no difference in demographic and clinical characteristics or prior care from a GP between patients that did or did not return for follow-up.

DISCUSSION

A systematic review of the limited asthma education for adults reports little benefit for the patient in ''the way it is currently practised'' and identifies a need for reconsideration [31]. In the present study, the traditional method of teaching patients was challenged through the application of a learner-centred process that shared common elements to patient-centred care [19]. The PCE also incorporated the acknowledgement of issues facing patients, in addition to their asthma, as the first step in building a therapeutic alliance to support the educator–patient relationship. Health professionals who may be unaware of their patient's social context and current asthma practices could possibly contribute to the less desirable outcome of ongoing symptoms and increasing complex treatment regimens [32–34].

By using this PCE method, clinical guidelines can be conveyed using a learner-centred process resulting in positive outcomes for patients, with both their and the health professionals' needs being met. The current authors believe that the PCE process goes part way to addressing a number of the patient education issues facing health professionals, such as the diverse perspectives of patients and health professionals and the difficulty health professionals face in translating clinical guidelines to patients [35–37]. Some ED studies of patients with acute asthma have focused on improving primary care follow-up through telephone reminders [15] and primary

care-based education [16], which have shown very little or no improvement in patient behaviour or asthma outcomes. Furthermore, a disproportionately high number of patients who do not have regular contact with their GP are admitted to hospital after seeking emergency care [38]. The PCE education method and its timing have the potential to benefit this particular patient group, as the findings of the present study suggest that patients in the PCE group without prior GP care had fewer re-attendances. Whether patients re-engaged with the primary physician rather than relying on secondary care is still yet to be ascertained.

Participants randomised to PCE group were asked what the most important issue was for them at that moment, and were advised to alert the educator to events/beliefs or concerns and fears that were affecting them [39, 40]. The action of acknowledging the patient's concerns indicates that the health professional is concerned about them as an individual [40, 41]. The current authors suggest that this action may encourage patients to be active participants, rather than taking a passive role while they deal internally with other issues. The PCE group was also asked what the most important asthma issue was for them, and themes from participants' responses reflect the past Australian National Asthma Council's campaigns. The present authors believe that the themes from the patient responses will reassure health professionals and organisations, such as the Australian National Asthma Council, that their campaigns are targeting appropriate asthma issues that are of concern to patients.

The results of the present study indicate that when patients are given a list of topics and the autonomy to choose the order in which they are to be delivered during the education process, they differed significantly in their choice from the standard format in current use. The PCE approach acknowledges that different patients with asthma may need specific information related to certain topics at different times in their life [42]. The change in prioritisation of topics between phase 1 and phase 2

further supports this premise. A standard curriculum delivered by means of a patient-centred approach to asthma education, using learner-centred elements, may go part way towards addressing these issues and provide a sustainable approach to asthma education in the ED.

The present study suggests that a learner-centred approach to asthma education may be useful in reducing re-attendances to the emergency department and, therefore, has important implications for the way health professionals educate patients. The uncomplicated, brief, patient-centred education process using a basic chronic disease guideline curriculum may be of value, particularly for people who are treated, educated and discharged from the emergency department. The patient-centred education approach needs further study and extension to confirm and generalise the results.

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