

EDUCATION

Effectiveness of asthma principles and practice course in increasing nurse practitioner knowledge and confidence in the use of asthma clinical guidelines

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Abstract

Purpose: The Asthma Principle and Practice (APP) course, an evidence-based blended distance-learning educational encounter, was designed to aid in the dissemination of the 2007 asthma clinical guidelines (EPR-3) and priority messages, increase knowledge of content of the guidelines as well as create an environment to enable participants to apply knowledge and skills into clinical practice. Students received a self-study binder 6-week period prior to attendance at an interactive study day. The APP is grounded in adult education principle and practices.

Data sources: A questionnaire was completed before reading the study binder and post study day to measure demographic variables as well as awareness of and changes in knowledge and confidence in key attributes of the clinical guidelines including patient education.

Conclusions: The results showed that by taking the APP course confidence levels related to knowledge of asthma and its management increased with specific reference to the asthma clinical guidelines. Confidence in the use of patient education/communication strategies improved as well as the use of pulmonary function tests and the interpretation of test results.

Implications for practice: Nurse practitioners are an important audience to target in the dissemination of clinical guidelines and benefit from educational materials based on adult education strategies.

"By taking the Asthma Principles and Practice Course I became more knowledgeable and confident in treating asthma patients."

Literature review

In 2007, the National Heart, Lung and Blood Institute (NHLBI) of the National Institutes of Health (NIH) released the third edition of the Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (commonly known as EPR-3 or asthma clinical guidelines; DHHS, 2007). In recognition of time taken to get research findings into practice (17 years; Institute of Medicine, 2001; DHHS, 2008a), as well as the need to reduce costly errors in the provision of medical care (IOM, 2000; Kohn, 2000), the NHLBI subsequently con-

vened a Guideline Implementation Panel (GIP) whose "charge was to identify barriers to implementing the clinical practice recommendations of the asthma clinical guidelines particularly among primary care providers" (DHHS, 2008b, p. 3). The GIP was tasked to develop recommendations and strategies for overcoming "improving acceptance and utilization of the asthma guidelines overall." The GIP selected six key messages that healthcare providers could focus on when delivering quality asthma care and that could have the greatest impact on asthma care. The six priority messages are shown in Figure 1. Current approaches to the delivery of health care emphasize a team-based approach, and particularly with the development of new models of care and new ways of financing health care including the medical home and

INHALED CORTICOSTEROIDS (ICS) ICS are the most effective medication for long-term management of persistent asthma.	ASTHMA CONTROL At planned follow-up visits, asthma patients should review level of control with the health care provider based on multiple measures of current impairment and future risk to guide clinician decisions to either maintain or adjust therapy.
ASTHMA ACTION PLAN All asthma patients should receive a written asthma action plan to guide their self-management efforts.	FOLLOW-UP VISITS Patients who have asthma should be scheduled for planned follow-up visits at periodic intervals in order to assess their asthma control and modify treatment as needed.
ASTHMA SEVERITY All patients should have an initial severity assessment based on measures of current impairment and future risk in order to determine type and level of initial therapy.	ALLERGEN AND IRRITANT CONTROL Healthcare providers should review each patient's exposure to allergens and irritants and provide a multipronged strategy to reduce exposure to allergens and irritants to which the patient is sensitive and exposed.

Figure 1 The Guideline Implementation Panel priority messages.

accountable care organization (Graham, 2012). Nurse practitioners (NPs) are, therefore, an important target group for initiatives that focus on the dissemination of evidence-based guidelines to increase acceptance and implementation.

NPs have a long history of providing healthcare services either working independently and/or collaboratively in a healthcare team. NPs perform tasks similar to their physician partners, including examination, diagnosis, diagnostic testing, treatment, and referral. NPs have improved access to health care for populations in rural, inner city, and other medically underserved areas. A recent article calls attention to the fact that shortfalls in recommended healthcare services is the lack of physician time Yarnall et al. (2009). The problem of insufficient time indicates that primary care requires broad, fundamental changes. The creation of primary care teams that include members such as NPs, and others, is important to meeting patients' primary care needs (Yarnall et al., 2009). NPs have the ability and responsibility to make an impact on the implementation of EPR-3 and the GIP Report. Indeed, Laurant et al. (2005) in looking at the substitution of doctors by nurses in primary care (Cochrane Review) concluded that doctor-nurse substitution has the potential to reduce doctors' workload and direct healthcare costs and achieve as good health outcomes for patients.

Delivering continuing medical education so that healthcare providers are updated on recent advances in clinical guidelines, and more importantly apply learned

information into clinical practice, is key to the success of guideline-based care. An important component of this is selecting educational strategies that engender optimal learning, both retention and application of learned information. Clark, Gong, & Schork (2000) evaluated the long-term impact of an interactive seminar for pediatricians, Physician Asthma Care and Education (PACE). PACE focused on communication skills that aid patient adherence to a therapeutic plan (Clark, Gong, & Schork, 2000; Brown, Bratton, Cabana, Kaciroti, & Clark, 2004). The PACE program was rigorously evaluated and showed that participants who attended PACE were more likely than controls to provide patients with asthma action plans, offer support on changing medications with changing asthma symptoms, and provide asthma education 2 years after the intervention. Moreover, there were fewer urgent care and emergency department visits, especially in a high-risk population (Cabana et al., 2006). The educational strategies implicit within the PACE program were based on social cognitive theory (Baranowskil, Perry, & Parcel, 2002) and adult education principles. In 2007, Education for Health adapted PACE in collaboration with the University of Michigan and created Nurse Asthma Care and Education (NACE).

It is conceivable that the type of educational strategies used impacts what learners implement in the real-world clinical setting. Kusrkar, Croiset, Mann, Custers, and Ten Cate (2012) have suggested that building curricula to specifically stimulate motivation in students may powerfully influence the outcomes of curricula.

Such approaches included experiential problem-based, and learner-centered approaches that effectively apply the domains of cognitive (what to learn), affective or motivational (why learn), and metacognitive regulation (how to learn). Sangestani and Khatiban (2012) compared the effect of problem-based learning and lecture-based learning on the learning process of undergraduate nursing students. Problem-based learning was seen to improve the application of theory to clinical practice, increase learning motivation, and enhance the educational activity in class.

Education for Health (formerly the National Respiratory Training Center) provides evidence-based and continuing medical education to allied healthcare providers. Continuing medication education curricula are based on experiential adult education principles. Following the release of the asthma clinical guidelines, Education for Health (EFH) launched the Asthma Principles and Practice course (APP), which reflected the new guidelines as well as integrated components of the PACE/NACE program. The APP is an evidenced-based and accredited continuing education program primarily, but not exclusively, targeted to advanced NPs. The educational methodology is a blend of self-directed learning through the provision of a distance-learning binder and application of what is learned to practice, during study days, through the use of structured, integrated case studies, role plays, student-led discussions, video, and lecture. NPs, as peer educators and faculty, interact with participants through the learning encounter. By implementing the APP with lead national NP professional organizations, we sought to evaluate the impact of the curriculum on NP knowledge and confidence in the use of key aspects of the asthma clinical guidelines: including awareness of the six priority messages of the GIP report, as well as the use of strategies that aid patient adherence to a clinically relevant therapeutic plan.

Methodology

The APP course was developed and implemented in concert with three national NP organizations (American Academy of Nurse Practitioners, American College of Nurse Practitioners, and the National Association of Pediatric Nurse Practitioners) during the period 2009–2011. The course was also implemented with an asthma coalition in Indianapolis that included nurses (RN) and respiratory therapists as participants. The course comprised two main components: (a) an interactive distance-learning study binder sent to participants 6 weeks prior to a (b) study day that took place at the annual meeting of the NP organizations. The study binder was designed with 11 modules that students read and completed exer-

cises, ideally on a weekly basis, and prior to the study day. One module used the communication techniques used by Physician Asthma Care and Education (PACE) program. The study day was focused on the application of the material in the distance-learning study binder to practice using case studies and role-plays etc. The process evaluation involved participants completing a course evaluation form that asked questions about the experience of the course, the educational style, and course-related materials. The evaluation form allowed for the use of open-ended statements. A prequestionnaire and immediately postquestionnaire was completed by participants to measure changes in asthma knowledge, use of the asthma clinical guidelines, communication skills to promote patient adherence, and knowledge of the six priority messages of the Guideline Implementation Report (GIP). The prequestionnaire was sent to participants along with the distance-learning study binder and participants were asked to hand the completed questionnaire to the faculty member at the start of the study day. The follow-up questionnaire was completed at the end of the study day. The follow-up questionnaire was also sent to participants 6 months after the completion of the study day, in an electronic format using Survey Monkey (www.surveymonkey.com), but due to the small number of respondents ($n = 23$) these data were not included in the analysis. Questions to assess change in the use of communication skills were taken from the questionnaire use to measure the impact of the PACE program (with approval from the Center for the Management of Chronic Disease at the University of Michigan). The study was reviewed and approved by the Institutional Review Board at Eastern Virginia Medical School. Changes in knowledge was assessed by six questions and measured on a 5-item Likert scale; the questions asked “how confident do you feel of your knowledge on the following topics?” Changes in use of the asthma clinical guidelines and communication skills were assessed in two domains (how helpful is it and how confident that you can do it well) using a 10-point Likert scale. To assess for normality of the data, descriptive statistics were computed. Analysis of the data proceeded using paired sample *t*-test for the pre and post knowledge and communication skills data. The McNemar test was used in the analysis of the six priority messages. Statistical significance was assumed at $p < .05$. Missing data were excluded from the analysis using pairwise and listwise deletion. More specifically when there were missing data for the variables “primary work setting” and “length of time worked with patients,” subjects were removed from the analysis by listwise deletion. The latter serves as a proxy measure of participants currently working in a healthcare setting with asthma patients. In addition, only NPs were included in the analysis.

Table 1 Demographics

	Frequency (n = 211)
Gender:	
Female	94% (n = 199)
Male	6% (n = 12)
Qualifications	
NP	99% (n = 208)
NP students	1% (n = 3)
Primary work setting	
Family practice	31% (n = 65)
Pediatrics	33% (n = 70)
Internal medicine	6% (n = 12)
Pulmonology	8% (n = 16)
Asthma/allergy	2% (n = 5)
Other	20% (n = 43)
Length of time working with asthma patients	
0–2 years	19% (n = 40)
2–5 years	24% (n = 51)
6–9 years	15% (n = 32)
10 or more	42% (n = 88)

Results

Demographics

Three hundred and thirty-three participants completed the APP course questionnaire at baseline, of which 256 participants completed the postcourse questionnaire. When the deletions noted above were completed, there were 211 sets of paired data representing NPs. Table 1 shows the breakdown of participant demographics. Figure 2 shows the breadth and spread of participants taking the course with the grey-shaded area indicating representation on the course. Of the 211 participants that completed the questionnaire at baseline, 94% of the participants were female, 6% were male. Sixty-four percent of the participants were based in primary care and either

from family medicine (31%) or pediatrics (33%). The length of time that participants had worked with asthma patients varied from 0 years to 10 years with 42% having worked with asthma patients for 10 years or more and 45% from 0 years to 5 years. At baseline 45% of participants carried out pulmonary function tests with participants to establish asthma severity. Eighty-three percent indicated that they monitored asthma patients for asthma control at follow-up visits. A majority of the participants could write and sign a prescription for asthma medications (89%).

Asthma knowledge

Increases in confidence of levels of knowledge after the study days were evident and significant (see Table 2) on measures that are important components of the asthma clinical guidelines and include: understanding the causes and pathophysiology of asthma; being able to take a comprehensive respiratory history; being able to obtain accurate spirometry measurements, and identify abnormal spirometry patterns as well as understand their significance; understanding the various drug treatment strategies for asthma, and using the asthma guidelines to choose appropriate medications; and the ability to provide appropriate education to patients about their asthma.

Clinical guidelines

Participants were asked about the use of the asthma clinical guidelines and for each question: (a) how helpful they believed the guidelines to be and (b) their level of confidence in doing recommended actions well. Comparing precourse with postcourse participants indicated that



Figure 2 NPs taking the APP and the states they represented.

Table 2 Knowledge of and confidence in the fundamental components of the asthma clinical guidelines

How confident do you feel of your knowledge on the following topics?	Change in mean (pre and post)	Results of paired samples <i>t</i> -test*
I understand the causes and pathophysiology of asthma.	<i>M</i> = 3.92 (<i>SD</i> = 0.9) <i>M</i> = 4.58 (<i>SD</i> = 0.61)	<i>t</i> (152) = 9.49
I can take a comprehensive respiratory history from a patient.	<i>M</i> = 3.80 (<i>SD</i> = 0.97) <i>M</i> = 4.67 (<i>SD</i> = 0.56)	<i>t</i> (154) = 11.65
I can obtain accurate spirometry measurements from patients.	<i>M</i> = 2.51 (<i>SD</i> = 1.35) <i>M</i> = 3.96 (<i>SD</i> = 1.0)	<i>t</i> (137) = 13.37
I can identify abnormal spirometry patterns and understand their significance.	<i>M</i> = 2.35 (<i>SD</i> = 1.25) <i>M</i> = 4.12 (<i>SD</i> = 0.89)	<i>t</i> (146) = 17.15
I understand the various drug treatment strategies.	<i>M</i> = 3.61 (<i>SD</i> = 1.0) <i>M</i> = 4.48 (<i>SD</i> = 0.69)	<i>t</i> (154) = 11.85
I can use the Guidelines to choose appropriate medications for patients.	<i>M</i> = 3.64 (<i>SD</i> = 1.0) <i>M</i> = 4.64 (<i>SD</i> = 0.67)	<i>t</i> (147) = 11.85
I feel confident in my ability to provide appropriate education to patients.	<i>M</i> = 3.73 (<i>SD</i> = 0.93) <i>M</i> = 4.65 (<i>SD</i> = 0.55)	<i>t</i> (153) = 12.94

*All significant at $p = .00$.

the asthma clinical guidelines are helpful as a resource for asthma information ($M = 9.55$, $SD = 1.0$, $t(134) = 7.23$, $p = .00$) and felt more confident in using them ($M = 8.95$, $SD = 1.36$, $t(132) = 12.67$, $p = .00$). In addition, participants found classifying asthma severity according to the guidelines to be helpful ($M = 9.53$, $SD = 1.02$, $t(134) = 7.27$, $p = .00$) and felt more confident in their ability to classify severity ($M = 9.08$, $SD = 1.26$, $t(133) = 13.6$, $p = .00$). Participant scores also increased in how helpful they found assessing asthma control ($M = 9.60$, $SD = 2.19$, $t(129) = 7.02$, $p = .00$) and their level of confidence in being able to assess for asthma control ($M = 9.60$, $SD = 0.9$, $t(1130) = 14.82$, $p = .00$).

Spirometry

The use of spirometry is an important component of assigning a severity classification and monitoring for asthma control. Before beginning the APP course, participants indicated that they were “a little confident” ($M = 2.51$, $SD = 1.35$) in their ability to obtain accurate spirometry measurements as well as identify abnormal patterns ($M = 2.35$, $SD = 1.25$). After the course, participants felt “often confident” ($M = 3.96$, $SD = 1.0$, $p = .00$) in obtaining accurate spirometry measurements as well as identify abnormal patterns ($M = 4.12$, $SD = 0.89$, $p = .00$). This indicates that participants benefited from the spirometry component of the APP course with increases in confidence being evident. The spirometry component included examining deidentified real-world spirograms taken from patients in clinical practice (performed by an NP). Participants independently read the spirogram, recorded the results (i.e., FEV₁ etc.). Subsequently, faculty presented

the answers and facilitated discussion about the results. Further practice and feedback in the clinical setting would further garner and cement these skills: increase in knowledge would be translated into learned behaviors by use of spirometry in the clinical setting.

Communication skills and patient-provider partnership

Communication skills between the patient and the healthcare providers are seen to be a necessary and important component of the delivery of care, although healthcare professionals may not recognize this to be the case. Patient/provider partnership, choice, and self-management approaches support the use of appropriate communication skills. Health professionals may not have been exposed to communication skills training in their postgraduate or continuing education studies. The communication techniques included within the AAP were based on those developed and tested in the implementation of the PACE and NACE program. The techniques are based on the premise that patient nonadherence to healthcare provider recommendations is a significant problem and that 10 simple communication strategies can significantly improve the interaction with patients as well as increase patient knowledge, satisfaction, and adherence. Evaluation of the PACE program showed that change in patients' health status and health care use occurred with both effective medicine and health education (Cabana et al., 2006). Participants completing the AAP showed improvements in how helpful they found components of the PACE/NACE program to be. These included nonverbal communication skills to show

Table 3 How helpful are strategies for patient education/communication?

How helpful do you believe it is?	Change in mean (pre and post)	t-Test result*
Use nonverbal communication strategies to show attentiveness.	$M = 8.96$ $SD = 1.87$ $M = 9.58$ $SD = 0.86$	$t(143) = 4.32$
Use nonverbal communication to give encouragement.	$M = 9.31$ $SD = 1.37$ $M = 9.84$ $SD = 0.47$	$t(142) = 5.19$
Give verbal praise for things done well by the patient/caregiver.	$M = 9.44$ $SD = 1.35$ $M = 9.86$ $SD = 0.47$	$t(141) = 4.20$
Ask the patient/caretaker about underlying worries and concerns.	$M = 8.89$ $SD = 1.83$ $M = 9.77$ $SD = 0.70$	$t(141) = 5.92$
Give specific reassuring information in response to worries expressed by the patient/caregiver.	$M = 9.10$ $SD = 1.60$ $M = 9.78$ $SD = 0.59$	$t(141) = 5.81$
Maintain interactive conversation.	$M = 9.30$ $SD = 1.48$ $M = 9.83$ $SD = 0.49$	$t(141) = 4.89$
Tailor the medication schedule to the patient's daily routine.	$M = 9.06$ $SD = 1.92$ $M = 9.72$ $SD = 0.77$	$t(141) = 4.73$
Reach an agreement with the patient/caregiver on a short-term goal for managing asthma.	$M = 8.85$ $SD = 1.94$ $M = 9.70$ $SD = 0.87$	$t(137) = 5.33$
Review with the patient/caregiver the long-term therapeutic plan.	$M = 8.92$ $SD = 1.9$ $M = 9.75$ $SD = 0.69$	$t(132) = 5.45$
Ask the patient/caregiver to repeat the asthma action plan.	$M = 8.73$ $SD = 2.0$ $M = 9.59$ $SD = 1.1$	$t(127) = 5.00$
Teach the patient caregiver to use criteria for making decisions about asthma management.	$M = 8.92$ $SD = 1.84$ $M = 9.77$ $SD = 0.63$	$t(131) = 5.73$

*significant at $p = .00$.

attentiveness and encouragement, asking the caregiver about underlying worries and concerns related to asthma, providing reassuring information in response to expressed worries, maintaining interactive communication (see Table 3). Participants also showed improvements in their belief that developing asthma management plans with the caregiver/patient was a helpful approach alongside reviewing the long-term therapeutic plan, asking the patient to repeat the asthma action plan and teaching the patient/caregiver to use criteria for making decisions about asthma management (see Table 3).

Agreeing shared goals of care between the patient and healthcare provider is a guiding principle in improving patient adherence with a therapeutic plan of action, including the use of an Asthma Action Plan. Participants showed statistically significant improvements in confidence in using each of these strategies with a mean score of 9.09 and above (10 being completely confident) after the APP course (see Table 4).

GIP report and awareness of priority messages

At the beginning of the course, participants were asked if they were aware of the Guideline Implementation Panel (GIP) report. Only 54 participants answered yes compared to after the study days when 132 answered yes ($n = 148$, $p = .00$). Furthermore, participants were asked if they were aware of the six priority messages of the GIP.

At the beginning of the course, 15 participants answered yes compared with 132 after the study days ($n = 146$, $p = .00$).

Evaluation of study days

Process data collected from participants indicated that the APP course was well received. Participant comments when asked the question "what was the best thing about the study days?" in relation to teaching style included the following themes: the interaction and sharing amongst the group of updates and common practice; hands on practice and case studies; the exercises and interactive learning approach; ability to brainstorm and allowing for questions to be answered; putting the study binder into practice with case studies, role plays, and practice of device use; and the open forum for questions and practicing consultations in a safe environment. Common themes emerged for the distance-learning study binder too and included very informative and practical, excellent resource materials and valued the ability to study at home ahead of the study days. These process data would suggest that NPs benefitted from the educational strategies that form an integral part of the teaching of the APP.

Discussion

The results of the posttest indicate that by taking the APP course confidence levels related to knowledge of

Table 4 Confidence in performing patient-centered communication strategies and patient education

How confident are you that you can do it well?	Change in mean (pre and post)	Results of paired samples <i>t</i> -test*
Use nonverbal communication strategies to show attentiveness.	<i>M</i> = 6.01 (<i>SD</i> = 2.84) <i>M</i> = 9.11 (<i>SD</i> = 1.22)	<i>t</i> (129) = 13.73
Use nonverbal communication strategies to give encouragement.	<i>M</i> = 9.03 (<i>SD</i> = 1.64) <i>M</i> = 9.84 (<i>SD</i> = 0.47)	<i>t</i> (145) = 6.39
Give verbal praise for things done well by the patient/caregiver.	<i>M</i> = 9.12 (<i>SD</i> = 1.58) <i>M</i> = 9.75 (<i>SD</i> = 0.61)	<i>t</i> (145) = 5.19
Ask the patient or his/her caretaker about underlying worries and concerns related to asthma.	<i>M</i> = 8.20 (<i>SD</i> = 2.06) <i>M</i> = 9.50 (<i>SD</i> = 0.92)	<i>t</i> (141) = 7.13
Give specific reassuring information in response to worries expressed by the patient/caregiver.	<i>M</i> = 8.24 (<i>SD</i> = 2.04) <i>M</i> = 9.43 (<i>SD</i> = 1.0)	<i>t</i> (142) = 6.71
Maintain interactive conversation.	<i>M</i> = 8.71 (<i>SD</i> = 1.72) <i>M</i> = 9.58 (<i>SD</i> = 0.80)	<i>t</i> (145) = 5.94
Tailor the medication schedule to the patient/family's daily routine.	<i>M</i> = 7.65 (<i>SD</i> = 1.72) <i>M</i> = 9.09 (<i>SD</i> = 0.80)	<i>t</i> (145) = 7.28
Reach an agreement with the patient/caregiver on a short-term goal for managing asthma.	<i>M</i> = 7.20 (<i>SD</i> = 2.63) <i>M</i> = 9.14 (<i>SD</i> = 1.20)	<i>t</i> (141) = 9.55
Review with the patient/caregiver, the long-term therapeutic plan.	<i>M</i> = 7.51 (<i>SD</i> = 2.44) <i>M</i> = 9.21 (<i>SD</i> = 1.21)	<i>t</i> (133) = 8.16
Ask the patient/caregiver to repeat the asthma action plan.	<i>M</i> = 7.38 (<i>SD</i> = 2.48) <i>M</i> = 9.36 (<i>SD</i> = 1.04)	<i>t</i> (131) = 8.91
Teach the patient/caregiver to use criteria for making decisions about asthma management.	<i>M</i> = 7.44 (<i>SD</i> = 2.44) <i>M</i> = 9.18 (<i>SD</i> = 0.99)	<i>t</i> (134) = 8.96

*significant at *p* = .00.

asthma and its management increased and with reference to the asthma clinical guidelines and the six priority messages of the GIP. Scores increased on how helpful participants believed the asthma clinical guidelines to be and how confident they felt in delivering on the key components of the guidelines. Forty-two percent of the participants had been in practice for over 10 years and the results suggest that a continuing medical education program of the depth and duration provided by the APP was of benefit. Moreover, likewise 43% had been in practice for 0–5 years, suggesting it is also of benefit to those with more limited experience. We succeeded in delivering the course to a primary care audience.

The clinical guidelines are revised or updated approximately every 3 years. While updates are important and indicate the dynamic and advancing field of asthma, their true worth is a feature of how well they are disseminated to intended audiences and moreover how they are used. NPs play an important role in the delivery of asthma care and many play an autonomous role in delivering care. The APP course has played an important and vital role in disseminating the content of the guidelines to this important audience as well as increasing confidence in their use. The data from the evaluation of the APP suggest that as per the aim of the Guideline Implementation Panel report, acceptance and utilization of the asthma clinical guidelines has improved in the partici-

pant pool. Indeed, advanced NPs are an important audience for the dissemination of the clinical guidelines and the use of educational strategies firmly rooted in adult education principles are imperative: the format, structure, and delivery of the APP course have proven to be effective.

Although 45% of the participants indicated that they carried out pulmonary function testing with patients, results from the precourse questionnaire showed participants to be “a little confident” in their ability to obtain accurate spirometry as well as identify abnormal spirometry patterns. While the course should make improvements in knowledge and confidence of spirometry techniques, further focused training on spirometry may be useful along with mentored hands on experience in the classroom and clinic.

Limitations

There are limitations to the design of the evaluation of the APP. The impact of the course would have been better gauged in a more longitudinal design. We conducted a 6-month postcourse evaluation but the response rate was low despite at least three reminder e-mails being sent to participants. Response rates may have increased with the provision of incentives. We had no control over whether the respondents complete the preevaluation survey

before opening and reading the distance learning study binder. It is possible that some participants completed the questionnaire after reading part or all of the study binder and consequently diluted the impact of the course. The evaluation did not include a control group that could have enhanced the outcomes of the evaluation as well as the generalizability of the results.

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