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ORIGINAL ARTICLE

Improving childcare staff management of acute asthma exacerbation – An Australian pilot study

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ABSTRACT

Objective: This study aimed to evaluate the effectiveness of an asthma first-aid training tool for childcare staff in Australia. The effects of training on both asthma knowledge and skills were assessed. **Methods:** A pre/post-study design was utilised to assess changes in asthma knowledge and asthma first-aid skills in childcare staff before and after an educational intervention. Asthma first-aid skills were assessed from the participant's response to two scenarios in which a child was having a severe exacerbation of asthma. Asthma knowledge and asthma skills scores were collected at base-line and 3 weeks post the education session, which involved feedback on each individual's skills and a brief lecture on asthma delivered via PowerPoint presentation. **Results:** There was a significant improvement after intervention in asthma knowledge ($Z = -3.638$, $p < 0.001$) and asthma first-aid skills for both scenario 1 ($Z = -6.012$, $p < 0.001$) and scenario 2 ($Z = -6.018$, $p < 0.001$). In scenario 1 and 2, first-aid skills improved by 65% ($p < 0.001$) and 57% ($p < 0.001$), respectively. Asthma knowledge was high at baseline (79%) and increased by 7% ($p < 0.001$) after the educational intervention. These asthma knowledge results were not significant when adjusted for prior knowledge. Results suggest that knowledge assessment alone may not predict the practical skills needed for asthma first-aid. **Conclusions:** Skills assessment is a useful adjunct to knowledge assessment when gauging the ability of childcare staff to manage acute asthma exacerbation. Skills assessment could be considered for incorporation into future educational interventions to improve management of acute asthma exacerbation.

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Introduction

Asthma is the most prevalent chronic disease of childhood [1] with approximately 14% of children worldwide experiencing symptoms of asthma [2]. Asthma is also thought to be the leading cause of childhood morbidity [1]. Managing acute exacerbations of asthma is a critical component of asthma management [1]. In an ideal world each person with asthma would have a current asthma action plan which specifically states how to best manage symptoms in that individual [1]. However, these action plans are not always readily accessible when an asthma emergency occurs. According to Australian Asthma Management Guidelines an acute exacerbation of asthma can be mild/moderate, severe, or life threatening [3].

Moderate-to-severe symptoms of asthma are characterised by inability to complete sentences in one breath, obvious respiratory distress, the 'tracheal tug' or use of the intercostal neck muscles during breathing [3]. When these symptoms occur, current Australian Resuscitation

Council (ARC) guidelines recommend provision of short acting beta agonist (SABA) bronchodilator with a valved holding chamber (also known as a spacer), in addition to practical measures such as calling the ambulance [4]. This management is referred to as asthma first-aid [3]. It is important to acknowledge that asthma first-aid is only the first of many steps in the management of the child who has experienced a severe exacerbation of asthma. The effects of SABAs are transient and the importance of follow up by a medical professional which frequently requires the prompt administration of corticosteroids is widely acknowledged [1, 5].

In Australia, in the absence of an action plan, asthma first-aid includes four puffs of SABA administered via a spacer every 4 minutes. In the United Kingdom and the United States, protocols vary slightly but all include the use of SABA and calling an ambulance if necessary [6–9]. These measures are employed to ensure children are seen by medical staff in a timely manner for the prompt

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Table 1. Asthma first-aid provision checklist.

Action	Yes (2 points)	Partial (1 point)	No (0 points)
1. Sit Child upright was calm and reassuring			
2. Organizes to call an ambulance while providing the child with salbutamol Or Organizes to call an ambulance after the child is provided with salbutamol			
3. Correct medicine selected	Ventolin/Asmol	Bricanyl	
4. Correct device selected	pMDI	nebuliser	
5. Spacer and mask selected as required equipment	both	Only 1/adult mask	
6. Mask inserted correctly into spacer			
7. Inhaler shaken			
8. Inhaler inserted correctly into spacer	1 st attempt	2 nd attempt	
9. Single puffs of salbutamol provided (not multiple puffs altogether)			
10. Reported correct number of single puffs of salbutamol appropriate for asthma first-aid	4	2–3 or 5	1
11. Allowed child tidal breaths between salbutamol puffs	4–5	2–3	<2or>5
OUTCOME			
12. Reported staying with the child to monitor while waiting for medical assistance			
ALTERNATIVE			
13. Reported knowing to wait before starting another round of salbutamol treatment.	4 minutes	1–6 minutes	Didn't wait
14. Reported knowing to keep going with salbutamol treatment while waiting for ambulance			
Total Score			

provision of corticosteroids [10] if required, and of course the prevention of a life threatening situation which is characterised by cyanosis and loss of consciousness [3].

In Australia, time spent by preschool-aged children in childcare settings has increased, with the average weekly hours spent in long day care, increasing from 19 to 26 hours between 2004–2009 [11] and data indicate that 48% of all children aged 0–12 regularly attended some form of childcare in 2014 [12]. In the United States 61% of children between the ages of 3–6 (not yet in kindergarten) were reported to be in centre-based care arrangements [13]. Therefore, childcare staff may be increasingly required to manage acute exacerbations of asthma. In the United States, for example, over a 12-month period, 55% of childcare staff treated an asthma exacerbation in the previous year [14].

The provision of asthma first-aid education is multifaceted, and requires the assessor to evaluate whether the staff member has the practical skills needed to administer a SABA to a person having a severe exacerbation, as well as assessing the knowledge of the staff member. To fully assess the practical skills required in asthma first-aid, a scenario based training module was developed by the research team that detailed two separate incidents requiring the staff member to satisfy a number of criteria thought essential in asthma first-aid. Staff members' performance was marked using the Asthma First-aid Provision Score (Table 1). This study primarily aimed to evaluate this unique asthma first-aid training method, and evaluate if scenario-based training can act as both a training and evaluation tool to improve asthma first-aid skills in childcare staff. As such our null hypotheses were that there were no differences in asthma knowledge and

asthma skills after scenario based training with feedback and education.

Methods

Study design

A pre/post-study was undertaken to determine if scenario based training was an effective training and evaluation tool in asthma first-aid management education for child care workers. At baseline, demographic information was collected. Centre directors were asked to report total numbers of children in care, numbers with asthma, presence of asthma first-aid kits and location of asthma action plans. Participants were asked to report age, formal education levels, language spoken at home and any prior formal asthma education. Participants completed an asthma knowledge questionnaire. This questionnaire was used to assess knowledge related to asthma first-aid and was developed specifically for this study, consisting of 14 true/false items adapted from two asthma knowledge questionnaires previously validated for consumers and parents or guardians of children with asthma [15,16]. Each correct answer provided one point with a maximum possible total score of 14 points (Table 2).

At baseline, participants undertook the asthma knowledge questionnaire followed immediately by the skills based assessment. The skills assessment was an observation session conducted by a researcher with an individual participant. Each participant was marked using the Asthma First-aid Provision Checklist (Table 1) after each of the two scenarios, and was given immediate feedback after completing both scenarios. Following the scenario

Table 2. Asthma knowledge questionnaire.

Asthma knowledge questionnaire fact	T or F
1. Children can become addicted to asthma medications if they use them all the time	
2. If an asthma action plan written by the child's doctor is followed, it can prevent hospitalisations due to asthma	
3. When you know that a child is going to be exposed to something that triggers their asthma, caregivers should give the recommended medication just before exposure	
4. Exercise can trigger asthma attacks in children	
5. Children should be given "preventer medication" when they have an asthma attack	
6. Caregivers should give "reliever medication" to a child as soon as they recognize the first sign of asthma	
7. After following the steps of Asthma first-aid, if the child's symptoms have resolved you can stop administering reliever medicine	
8. It's better to use inhalers directly, without a holding chamber (spacer), so the medication can go more directly to the lungs	
9. Children who have asthma shouldn't participate in sports that make them run too much	
10. When a child with diagnosed asthma has an asthma attack it is best to call the ambulance straight away even if symptoms are mild	
11. Children with asthma might have attacks that are severe enough to cause death	
12. During an acute attack, a caregiver should not give more than two puffs of reliever medicine or the child will have too many side effects	
13. The signs of an asthma attack might include coughing and wheeze	
14. When you know that a child is going to be exposed to something that triggers their asthma, a caregiver should wait until they develop symptoms before giving medication	
Total Score (/14)	

testing and feedback, a brief PowerPoint verbal presentation on general asthma management as well as asthma first-aid was presented to participants in a group session.

Participants were also provided with a written asthma first-aid instruction card developed by the Asthma Foundation of New South Wales [17]. The intervention was delivered by a team comprising pharmacists and a pharmacy final-year student and a respiratory physiologist. The researchers then returned to the childcare centre 3 weeks after the first visit and participants completed the asthma knowledge questionnaire and repeated their skills assessment demonstrating their response to the same two hypothetical scenarios. Each participant spent approximately 20 minutes with one of the five researchers at each of the time points in addition to the group information session, which took approximately 1 hour.

Development of skills-based scenario training

To test practical skills required for the provision of asthma first-aid a checklist of the steps required for successful asthma first-aid was developed based on the ARC Guidelines [4]. This checklist became known as The Asthma First-aid Provision Checklist (Table 1) and was reviewed by respiratory experts within the research team. This

expert panel consisted of a respiratory physiologist a specialist respiratory pharmacist and a respiratory researcher with a track record in human respiratory research. The assessment required the use of two hypothetical scenarios (Appendix A) of children experiencing symptoms indicating an acute severe exacerbation of asthma as defined by Australian Asthma Guidelines [3].

Equipment that could be used by each participant was also made available; this included a variety of inhalers containing steroids, long-acting beta agonists and short acting beta agonists. A nebuliser with salbutamol nebules were also provided together with a mask and various spacer devices. An action plan was also produced if requested. Scenario one detailed a 4-year-old child suffering from wheeze without a concurrent asthma diagnosis with maximum score of 100% achieved upon correct provision of asthma first-aid including a call to an ambulance so that the child could be properly diagnosed at the hospital.

Scenario two involved a 5-year-old child known to have asthma who was experiencing asthma symptoms which were severe, with maximum score achieved if the child's asthma action plan was followed correctly. Both scenarios incorporated exercise as a common stimulus to asthma symptoms, and both included symptoms of a child experiencing a severe exacerbation of asthma characterised by coughing, a whistling sound when the child breathed out and inability to talk in sentences with tracheal tug. These scenarios gave the researchers an easy tool to prompt the participant to physically demonstrate asthma first-aid; the hands-on skills needed to use the equipment and medicines that are essential in asthma first-aid. The scenario training became both an assessment and a training tool when the researchers provided immediate feedback to the participant after the second scenario was scored on The Asthma First-aid Provision Checklist. This immediate anonymised feedback is an evidence based strategy in teaching health care provision [18,19].

Scoring of asthma first-aid skills

The two scenarios were separately scored using the 14-item checklist known as The Asthma First-aid Provision Score (Table 1). Each correct response provided 2 points and 1 point was awarded for partially correct responses. The total score was expressed as a percentage for comparability between the two scenarios. Maximum points denoted correct knowledge of procedure, identification and assembly of equipment, inhaler administration technique and dosing and timing of medication use in relation to the scenario. From a practical standpoint, partial points were awarded for responses that did not strictly

adhere to ARC guidelines but would still stand to benefit the child, as deemed by the team of respiratory experts (e.g. partial points were awarded if the participant provided three puffs of salbutamol rather than the recommended four). When calculating the scores, redundant scoring criteria were eliminated (e.g. points for correctly inserting the mask into the spacer were not applicable if no mask was used in the scenario).

To obtain an overall rating of “appropriate management” the responses had to satisfactorily complete steps 3, 4, 9 and 10 from the checklist (Table 1), which primarily dealt with the correct delivery of bronchodilator, and included choosing salbutamol pressurised metered dose inhaler (pMDI) and successfully providing single puffs from the device as well as achieving an overall score of 70% or higher. These four steps being achieved combined with a score of at least 70% were considered “appropriate management” as they showed the participant was competent in asthma first-aid with the necessary skills to potentially save the life of a child having a severe exacerbation of asthma.

Participants and recruitment

The study was conducted between August and October 2011. The study protocol was approved by The University of Sydney Human Research Ethics Committee and endorsed by KU Children's Services (An Australian based provider of early childhood education). Centres were recruited by the research team through phone or email. Those who agreed to participate signed a consent form. As this was a pilot study, participants were recruited by convenience sampling of childcare centres identified in Google maps to be in the Sydney metropolitan area, encompassing a range of suburbs with varying socioeconomic status. Childcare centres were eligible for recruitment if children between the ages of 0–5 years were in care. Individuals were eligible for participation if they were childcare staff or trainees, 18 years or older and cared for children between the ages 0–5 as part of their work-related duties.

Statistical analysis

Each participant was de-identified and given a unique number so that their pre/post-results could be matched and analysed using IBM SPSS Statistics Version 19. Data were excluded on a test-by-test basis to account for missing pairs of data and for all outcome variables normality tests were conducted using the Kolmogorov–Smirnov test. For correlations, scatterplots were examined to ensure no violation of normality, linearity and homoscedasticity. For variables not normally distributed, comparisons between paired groups were conducted

using the Wilcoxon signed rank test and the Mann–Whitney test was used for independent groups. For proportional data McNemar's test was used for comparisons between paired groups. Spearman's correlations were used to examine the relationship between asthma knowledge and asthma first-aid skills in each scenario at baseline and post-intervention. To establish whether there was a difference in the knowledge and skills scores in those with prior asthma education versus those without a one-way analysis of covariance (ANCOVA) test was used. A two-tailed, 5% (0.05) level of significance was used for all statistical procedures.

Results

Participants

Of the 21 centres contacted, only 9 agreed to participate within the study timeframe. One centre was excluded as children in care were older than 5 years of age. Reasons for non-participation included time constraints ($n = 4$), reservations regarding privacy ($n = 1$), centres already participating in other studies ($n = 1$) and lack of interest ($n = 6$). None of the childcare centres had an enrolment policy which excluded children because they had asthma.

A sample of 71 childcare staff (mean age 34.9 yrs, range 19–62 yrs) from eight childcare centres were recruited. The majority of staff from all centres participated with only those on leave unable to participate. Staff were responsible for the care of 562 children (0–5 years), 22 of which were known to have a clinical diagnosis of asthma (which was lower than expected from national statistics collected in this age group [20]), with 57.7% holding the minimum Australian qualification for work as a child care worker (Certificate III in Children's Services) and others holding further high level qualification or undergoing training. Additionally, 38% of staff reported receiving prior asthma education. The majority (63.3%) reported English as the main language spoken at home. Other languages included Bengali, Spanish and Chinese.

Asthma knowledge

Fifty-seven complete pairs of pre- and post-questionnaire data were used for data analysis. Reasons for lack of questionnaire completion were due to staff omitting to complete the questionnaire prior to intervention and loss to follow up. Asthma knowledge increased significantly from a baseline median score of 11 out of a possible 14 (79%) to a median score of 12 (86%) post-intervention ($p < 0.001$) (Table 3). At baseline participants with prior asthma education had significantly higher scores when compared to those with no prior asthma education

Table 3. Change in primary outcome measures.

	Before	After	<i>p</i> value [#]
Asthma knowledge* (<i>n</i> = 57)	11.00	12.00	<0
Scenario one** (<i>n</i> = 57)	14%	88%	<0
Scenario two** (<i>n</i> = 57)	68%	93%	<0

[#]*p* value from Wilcoxon signed rank test between baseline and post-intervention scores.

*Median asthma knowledge score out of 14.

**Median asthma skills assessment percentage score.

(*p* = 0.048), but no difference was found post-intervention (Table 4). When a one-way ANCOVA was conducted on the knowledge scores to control for those who had prior asthma training no significant increase in asthma knowledge was found.

Asthma first-aid provision score

Fifty-seven pairs of complete data were used for data analysis. Missing data were attributed to loss to follow up. This is largely explained by the variable nature and high staff turnover of this population. Wilcoxon signed rank test revealed a significant increase in asthma first-aid provision scores for both scenario 1 (*Z* = -6.012, *p* < 0.001) and scenario 2 (*Z* = -6.018, *p* < 0.001). When controlling for prior asthma training using ANCOVA the increase in skills were still significant for scenario 1 (*P* = 0.001) and scenario 2 (*P* < 0.001).

The analysis to determine the proportion of participants who were deemed competent or successful in each of the scenarios was also undertaken. To be deemed competent they had to have achieved sufficient skills to potentially save the life of a child having an asthma attack. A McNemar Test of independence repeated measures showed that for the first scenario there was a significant increase in the proportion of participants successfully treating the child, from 9% at baseline to 75% after our intervention (*p* < 0.001). In scenario 2, 35% of participants achieved a satisfactory outcome at baseline which significantly increased to 91% after the intervention (*p* < 0.001). The difference in the proportion of participants successful in scenario 1 versus scenario 2 could be attributed to the concrete diagnosis of asthma, and the asthma management plan that was available for the child in scenario 2.

Relationship between asthma knowledge and asthma first-aid provision score

There was no significant difference in asthma first-aid provision scores at baseline for those with prior education versus those without. However, post-intervention scores revealed that those with prior asthma education

Table 4. Differences in primary outcome measures between those with prior asthma education and those without.

	With prior asthma education	Without prior asthma education	<i>p</i> value [#]
Asthma knowledge (<i>n</i> = 57)*			
Baseline	12	10	0
Post-intervention	13	12	0.373
Scenario 1 (<i>n</i> = 57)**			
Baseline	7%	14%	0.834
Post-intervention	93%	86%	0
Scenario 2 (<i>n</i> = 57)**			
Baseline	58%	68%	0.279
Post-intervention	100%	86%	0

[#]*p* value from the Mann-Whitney test between those with prior asthma education and those without.

*Asthma knowledge score out of 14.

**Median Asthma Skills Assessment percentage score.

performed significantly better for both scenarios, [(*p* = 0.012 and *p* = 0.001 respectively) (Table 4)]. A significant positive correlation was only found between baseline asthma knowledge scores and baseline asthma first-aid provision scores for scenario two; (*p* = 0.024, Spearman's rho = 0.299) and post-intervention (*p* = 0.02, Spearman's rho = 0.397) When the same analysis was performed on the data for scenario one there was no significant correlation between knowledge and first-aid provision scores.

Discussion

This pilot study is unique in that it incorporates hands on practical assessment of skills. Our results suggest that the addition of the scenario based learning tool to the more traditional lecture style educational session may result in a childcare worker who is better equipped to deal with an acute exacerbation of asthma. The practical assessment appears to be both an assessment tool and an educational intervention with the inclusion of the immediate feedback which was provided by the research team at the time of testing.

Asthma knowledge was unexpectedly high at baseline despite only 38% of participants recording any prior asthma training. This could possibly be attributed to evidence showing that asthma knowledge increases with the time spent working in childcare [14,21]; however, this parameter was not collected in this study so it is unknown if this was the reason. Asthma knowledge scores were marginally increased post-intervention; however, it is questionable whether an increase of only 1 point is meaningful. The questionable nature of the improvement was reinforced when the knowledge scores were analysed using ANCOVA and it was found that when adjusted to account for those who had prior asthma training no significant improvement was found in asthma knowledge.

Interestingly, asthma first-aid provision scores for the scenarios were low at baseline and there was a moderate positive correlation between baseline asthma knowledge and scenario two scores. These data suggest a high level of asthma knowledge is not a predictor of asthma first-aid skills. Prior asthma educational intervention studies in childcare staff are limited; however, the studies which were located, focussed on knowledge scores, which consistently demonstrated increased levels of asthma knowledge post-intervention [22–24]. Although testing knowledge is reliable and easily implemented, the scope of the measure is limited [25] as according to Miller's pyramid of clinical assessment the acquisition of knowledge gives us only part of the picture and is not an indicator of competent performance [25]. Asthma First-aid Knowledge may not translate into the skills required to choose the correct inhaler and spacer device and put it together so that a dose of SABA can be administered.

Baseline asthma skills scores significantly improved after the educational intervention. Scenario 1 and 2 differed markedly in their inclusion of a child with a known asthma diagnosis for Scenario 2. The significantly lower baseline scores in scenario 1 compared with scenario 2 indicate confusion in our participants concerning what to do if there is no diagnosis of asthma and possibly a reluctance to treat asthma symptoms without an asthma diagnosis. Whilst we did observe significant improvements in the proportion of participants able to successfully manage both of our scenarios after our intervention, the inability of staff to successfully provide asthma first-aid or follow asthma action plans at baseline, despite prior asthma training is a concern, particularly given the high baseline knowledge scores. However, it is important to note that those with prior asthma training did have significantly better skills for scenario 1 ($p = 0.012$) and scenario 2 ($p = 0.001$) after the intervention than those with no prior asthma training (Table 4). This may suggest that multiple education sessions may be required before optimal performance is attained, an idea supported by research showing continued improvement in inhaler technique following repeated educational interventions [26].

Results from this study have implications for the development of future asthma educational interventions. Our study demonstrates that skills assessment with immediate feedback may be preferable to knowledge assessment alone when exploring the ability of childcare staff to manage acute asthma exacerbation. Previously, skills assessment has been used to assess the ability of parents [27–29] and children with asthma [30–35] to correctly administer asthma medication, albeit in respect to inhaler technique. Our intervention differs from past research [27,29] by providing context to the administration of an inhaler medicine namely, a scenario, equipment choice,

dosing and timing and unlike prior interventions [36–46]. This pilot study also targeted childcare staff, a seemingly neglected caregiver population [24].

Currently, skills testing in the form of simulation is used in assessing and confirming the ability of participants to provide cardiopulmonary resuscitation (CPR) in well-known first-aid training courses [47]. Given the high prevalence of asthma in the 0–5 age group, it is envisaged that the likelihood of staff providing asthma first-aid far exceeds the need to provide CPR. Therefore, the inclusion of skills assessment with immediate feedback into future asthma education programs could serve to guarantee the ability of staff to manage acute asthma exacerbations. Additionally, comparison of baseline percentage scores between the two scenarios indicates a need for the future inclusion of content with regard to the treatment of symptoms in the absence of an asthma diagnosis.

Although we demonstrated improvements in asthma first-aid skills, limitations of study design should be considered when interpreting results. First, the inherent structure of a pre/post-study combined does not allow for the direct attribution of our results to the individual educational interventions, the skills-based assessment or education session given via a PowerPoint presentation. With the use of convenience sampling the generalisation of results to the wider childcare staff population may also not be possible. Whilst information was collected regarding prior asthma training, no information was collected which related to the participants own diagnosis of asthma, this may have affected the knowledge and skills scores of that individual.

There was also a risk of self-selection bias through the inclusion of centres proactive with staff training and hence likely to score well in the asthma knowledge questionnaire. Further limitations of this pilot study relate to the asthma knowledge questionnaire and the Asthma First-aid Provision Checklist. The questionnaire, while consisting of previously validated items modified slightly from questionnaires developed for consumers [15,16], is yet to be validated. The Asthma First-aid Provision Checklist is also not yet validated. Despite the best efforts of the research team to provide guidance around the marking schedule it does remain a subjective measure relying on the researcher to make judgment calls. The research team made every effort to provide scenarios which were free of ambiguity; however, it could be argued that these scenarios could have included more severe symptoms of asthma such as an ashen colour, lethargy and concerns about breathing. Finally, this research was an Australian pilot study based on Australian guidelines which may not necessarily always fit with local asthma guidelines employed in other countries.

Conclusion

This pilot study utilised skills assessment in asthma first-aid training for childcare staff. After our educational intervention, we demonstrated a modest improvement in asthma knowledge, and a significant improvement in asthma first-aid skills, which translated to a higher proportion of caregivers demonstrating competence in asthma first-aid management. Thus, we showed that skills based training with feedback and education can improve asthma first-aid skills. Furthermore, this pilot study appears to demonstrate the failure of the more generalised knowledge assessment to identify the skills set of the participant which specifically relate to the practical management of an acute asthma exacerbation in a childcare setting. Therefore, the inclusion of skills assessment targeted at the treatment of acute asthma exacerbations is a vital component to future asthma education interventions.

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Declaration of interest

No financial or professional relationships relevant to this article to disclose. There are no conflicts of interests to declare.

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Appendix A. Scenarios 1 and 2.

SCENARIO 1

Today you are working at the day care centre and there are only two staff currently on duty (yourself and a colleague). Jessica is a 4-year-old who regularly attends day care. First thing this morning, her mother mentioned that she has begun to notice that Jessica might have croup as she has had some trouble breathing lately and asks you to keep an eye out for her. She also reports that Jessica has been getting a dry cough at night. Her mother says she has an important meeting this morning so cannot keep Jessica at home. As you watch over the children during play time, you notice that Jessica has stopped chasing her friends and is sitting by the side. She is not as active as usual and looks a bit upset. When you approach her, you hear a whistling sound when she breathes out. She appears to be having trouble talking and she is coughing. What do you do?

OUTCOME

If Ventolin is given, after a few puffs, Jessica appears to recover, her breathing less laboured, she is no longer coughing and is no longer upset – is there anything else you would do?

ALTERNATIVE

Jessica does not appear to improve after being given some Ventolin – what would you do?

SCENARIO 2

Jimmy is a 5-year-old boy who has been diagnosed with asthma. Today, while playing soccer, you notice that he stops running and heads towards you. He appears to have trouble breathing. You can see that he is quite breathless and is working quite hard to breathe. As he breathes out, you hear a whistling sound and the muscles at the base of his neck are tugging. He is becoming increasingly distressed. What do you do?

OUTCOME

If Ventolin is provided – Jimmy is still breathless after the 1st round of Ventolin so you provide him with another. After two rounds of Ventolin, there is improvement. Is there anything else you would do?

ALTERNATIVE

After 2 rounds of Ventolin, Jimmy is still having difficulty breathing, it appears not to have improved, what would you do?