

Giving Asthma Support to Patients (GASP): a novel online asthma education, monitoring, assessment and management tool

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ABSTRACT

BACKGROUND AND CONTEXT: Giving Asthma Support to Patients (GASP) is a unique online tool developed to provide asthma education at point of care, and to provide health care professionals in primary care with skills and knowledge to undertake a structured asthma assessment.

ASSESSMENT OF PROBLEM: A retrospective cohort study was undertaken to evaluate the effectiveness of GASP. Data for patients aged 5–64 years seen in primary care (Waitemata region of Auckland) with uncontrolled asthma who had completed a minimum of two GASP assessments between 1 November 2008 and 17 April 2011 were extracted from a secure, self-populating database. Outcome measures were compared between each patient's visit 1 and 2 assessments.

RESULTS: A total of 761 patients provided data using GASP. There was a significant reduction between GASP assessments in the risk of exacerbations, hospital admissions, emergency department presentations, requirement for corticosteroids, and bronchodilator reliance.

STRATEGIES FOR IMPROVEMENT: Results from this retrospective cohort study are promising. A randomised controlled trial of the use of GASP in primary care is warranted to confirm these findings. The effectiveness of the GASP tool also needs to be further investigated in Māori and Pacific populations.

LESSONS: The findings of this study of GASP show its potential and support its use in the primary care setting.

KEYWORDS: Asthma; decision support techniques; primary health care, retrospective study

Background

Evidence has shown that internet-based technology can be used to successfully monitor and manage various diseases. It has been argued that internet-based technology has great potential as a means of providing better treatment for chronic conditions, such as asthma, diabetes and hypertension.^{1–3} The possibilities vested in these technologies rest on the claim that they create more durable connections between the patient and professional, thus providing pervasive health care expertise, standardised in accordance with current evidence-based guidelines.⁴ Regular asthma reviews are recommended by international guidelines to improve asthma morbidity, and there is a need for a structured assessment to facilitate this

in routine primary care practice.^{5–7} There is a need for a simple and robust assessment instrument to structure patient visits, and assess asthma treatment in primary care. An important part of these reviews is to assess overall asthma control. The goal of asthma treatment is to achieve clinical control, which implies minimal symptoms and use of reliever medication, no limitations in everyday activities, no night waking, no exacerbations, normal lung function, and no side effects from medication.^{5–7} Several surveys have suggested that both patients and health care professionals overestimate the level of asthma control.^{8–11} Many patients perceive their asthma to be mild and well controlled, despite reporting frequent symptoms.^{8,10–12} Also, asthma patients

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have been shown to have low adherence to treatment guidelines^{9,10,13-18} and poor knowledge of the disease.¹⁷ Written personal management plans exist, but appear to be only of limited use and patients often remain poorly controlled, as reflected in frequent episodic asthma, inadequate prescription of preventive treatment, and many patients continuing to experience symptoms^{8,17,19}. Several instruments have been developed for measuring asthma control. These include: the Asthma Control Questionnaire (ACQ);²⁰ the Asthma Control Test (ACT);²¹ and for measuring health-related quality of life (HRQL), the Asthma Quality of Life Questionnaire (AQLQ);²² and the shorter version, the Mini-Asthma Quality of Life Questionnaire (Mini-AQLQ).²³ Some of these tools are suited for primary care use, but there remains a need for a specific instrument to help structure patient visits and assess asthma treatment in primary care. The Giving Asthma Support to Patients (GASP) tool is unlike previous tools, as it has built-in decision support, based on current guidelines,⁵⁻⁷ which encourages best practice. The GASP online tool also includes recording the following: spirometry testing, asthma symptoms scores, exacerbations, peak flow measurement, asthma triggers, medication adherence, inhaler technique, and review of action plans. In this retrospective cohort study, we aimed to measure the effectiveness of the GASP tool in improving asthma outcomes, such as exacerbations, hospital admissions and medication usage.

Assessment of problem

GASP was developed and validated using a multi-faceted approach. Underpinning the GASP tool decision support are the 'levels of asthma control', as detailed in international guidelines.⁵⁻⁷ GASP was developed with patients and clinical expert input. A six-month pilot study was conducted using the GASP tool in June 2008, involving five general practices with 18 nurses and 185 patients aged 5-64 years. This pilot study showed the ease of use of the tool, with good nurse and patient satisfaction, and improved patient outcomes resulting in reduced exacerbations (data, unpublished). Any potential problems with the tool highlighted during the pilot study (from patients, nurses, or doctors) were identified by a questionnaire and several focus group meetings. Altera-

WHAT GAP THIS FILLS

What we already know: To date there is no known online asthma support tool used by health care professionals in New Zealand that has demonstrated improvement in patient outcomes.

What this study adds: GASP is the first tool to have provided evidence that it significantly improves patient outcomes in the primary care setting. It is envisaged that a greater number of general practices in New Zealand will implement the GASP tool as part of their routine asthma management plan in order to significantly improve patient outcomes.

Figure 1. The one-page GASP tool, showing all available fields for a comprehensive asthma assessment

Selected information will populate from notes. The drop-down boxes and compulsory questions are marked with red bars. There also is a section for 'free text' in the middle. Pop-up 'prompts' assist the health care professional with the line of questioning. There are additional individualised pages to trigger advice, action plan, decision support and lung function measurements (all shown by clicking on hypertext headings). A colour version of this Figure can be seen in the web version of this paper.

Note: Patient demographic details have been obscured.

tions and revisions were made to the GASP tool in line with focus group recommendations and current international guidelines. The GASP tool was then reviewed and approved by the clinical expert team and was also endorsed by the Asthma Foundation of New Zealand, as well as the New Zealand Nurses Organisation (Respiratory Section) prior to its launch in November 2008.

GASP is exclusively for use by health care professionals as a decision support tool. Figure 1 shows the start-up screen of GASP, which includes baseline height and weight measurements, asthma

and medication history, spirometry values, inhaler technique, asthma triggers, peak flow values, and patient consent. Based on the patient data entered into GASP, the health care professional is provided with a calculated asthma severity and the tool then suggests an appropriate level of pharmacological intervention (e.g. inhaled corticosteroid up-titration) and non-pharmacological interventions (e.g. trigger avoidance), by the use of 'drop-down' boxes. GASP was not integrated with clinical software already in use in primary care practices, but was provided as an independent clinical support tool for the management of asthma.

Anonymised data from all patients who presented to their primary care health provider with partly controlled or uncontrolled asthma, aged 5–64 years, and who had completed a minimum of two GASP assessments from 1 November 2008 to 17 April 2011 (approximately 30 months) were obtained from a secure, self-populating online database. Data were obtained from patients who had consented to the use of their information.

Data were compared between all patients' visit 1 (pre-GASP intervention) and visit 2 (post-GASP intervention) assessments over the 30-month period, using IBM SPSS Statistics (Version 20.0.1). Ethical approval was not required as this was an analysis of anonymised records from a self-populating, secure database. All patients included in the study provided consent at the time of data collection for the use of their data in anonymised data analysis and subsequent publication.

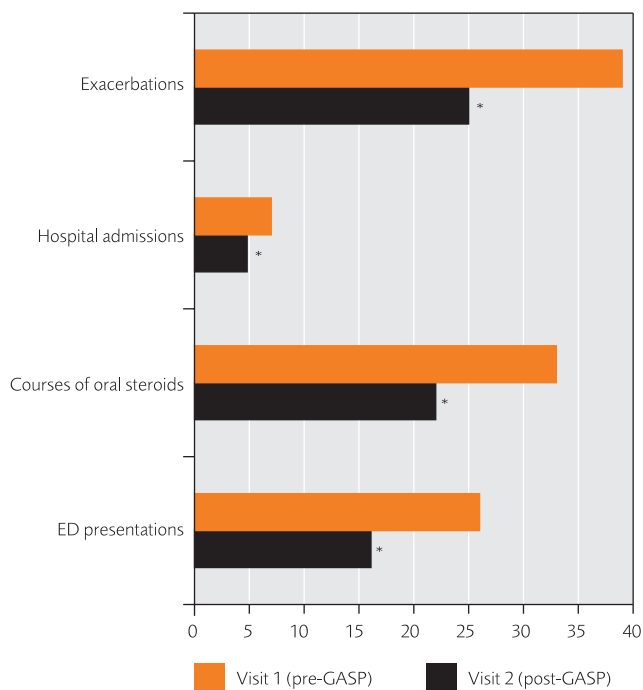
To assure quality and consistency of care and appropriate use of GASP, all patient assessments were conducted by GASP-accredited nurses. The basis of this accreditation process is the New Zealand Asthma Foundation's 'Fundamentals' course, which is a New Zealand Qualifications Authority (NZQA) course accredited at level 7. In addition, nurses were trained with the GASP training component, which supports the concept of nurse-led asthma clinics within the primary care setting. The GASP training component includes skills in assessing the patient with asthma, including critical thinking and case review skills. Expert-supported practicals are also offered to each nurse when assessing a patient in their clinic, as well as detailed skills on setting up an asthma clinic (e.g. how to improve clinic visits, non-adherence issues, protocols, audits). There is also an 'in-depth understanding of asthma medications' module and all nurses undergo testing with a minimum pass mark of 80%. The GASP tool is also shown to all patients and a unique education package for each patient is explored. It is this unique education for patients that has resulted in informed choice, further knowledge, understanding and self-management, leading to improved health.

Outcomes considered in this retrospective cohort study included exacerbations requiring medical intervention, emergency department (ED) presentations, hospital admissions, course of oral corticosteroids and use of short-acting beta agonists (SABA).

Results of assessment/measurement

Statistically significant improvements were seen with the use of the GASP tool for all study outcomes when pre-GASP visit (visit 1) was compared to visit 2 (Figure 2). Tables 1 and 2

Figure 2. One or more exacerbation, hospital admissions and oral corticosteroid requirement comparing screening visit (visit 1, before GASP initiated) to visit 2, recorded after using GASP



ED Emergency department

* Statistically significant difference with $p < 0.05$

Table 1. Relative risk of exacerbations, hospital admissions and emergency department presentations between visit 1 and 2 GASP assessments

Outcome since visit 1 (2nd vs 1st GASP assessment)	Asian (n=61) RR (95% CI)	New Zealand European (n=638) RR (95% CI)	Māori (n=44) RR (95% CI)	Pacific (n=18) RR (95% CI)	Total (N=761) RR (95% CI) NNT (95% CI)
One or more exacerbations	0.56* (0.33–0.94)	0.64* (0.54–0.76)	0.86 (0.50–1.50)	0.86 (0.36–2.05)	0.65* (0.56–0.76) 7 (6–11)
Exacerbation free	1.35* (1.04–1.76)	1.22* (1.13–1.32)	1.09 (0.79–1.50)	1.09 (0.67–1.79)	1.22* (1.14–1.31)
One or more hospital admissions	1.00 (0.21–4.76)	0.69 (0.44–1.09)	0.49 (0.13–1.83)	0.33 (0.04–2.91)	0.67* (0.44–1.00)
Hospital admission free	1.00 (0.92–1.08)	1.02 (1.00–1.05)	1.08 (0.94–1.25)	1.13 (0.90–1.43)	1.03* (1.00–1.05)
One or more ED presentations	0.65 (0.33–1.26)	0.64* (0.51–0.80)	0.39* (0.17–0.91)	0.80 (0.26–2.50)	0.63* (0.51–0.77) 10 (7–17)
ED presentation free	1.14 (0.93–1.38)	1.12* (1.06–1.19)	1.33* (1.03–1.70)	1.08 (0.74–1.57)	1.13* (1.07–1.19)

GASP Giving Asthma Support to Patients online tool

RR Relative risk

CI Confidence interval

NNT Number needed to treat

ED Emergency department

* Statistically significant difference between visit 1 and 2 GASP assessments, with $p < 0.05$

Table 2. Relative risk of oral corticosteroid requirement and short-acting beta-agonist bronchodilator (SABA) usage between visit 1 and 2 GASP assessments

Outcome since visit 1 (2nd vs 1st GASP Assessment)	Asian (n=61) RR (95% CI)	New Zealand European (n=638) RR (95% CI)	Māori (n=44) RR (95% CI)	Pacific (n=18) RR (95% CI)	Total (N=761) RR (95% CI) NNT (95% CI)
Oral corticosteroids					
No courses used	1.20 (0.96–1.50)	1.18* (1.10–1.26)	1.08 (0.82–1.42)	0.92 (0.60–1.43)	1.17* (1.10–1.24) 9 (6–14)
One or more courses used	0.62 (0.34–1.12)	0.64* (0.53–0.77)	0.91 (0.48–1.70)	1.20 (0.45–3.23)	0.66* (0.56–0.78)
SABA usage					
Not used	1.82* (1.14–2.93)	1.68* (1.43–1.98)	1.83 (0.87–3.87)	13.00 (0.79–21.91)	1.73* (1.49–2.01) 6 (5–8)
≤2 puffs/week	1.10 (0.68–1.76)	1.15 (0.98–1.35)	1.22 (0.65–2.30)	1.14 (0.53–2.48)	1.15 (0.99–1.33)
>2 puffs/week	0.63 (0.22–1.80)	0.53* (0.40–0.70)	0.84 (0.31–2.29)	0.14 (0.02–1.05)	0.53* (0.43–0.69) 11 (8–17)
≤6 puffs/week	0.18* (0.04–0.79)	0.64* (0.48–0.84)	0.44 (0.17–1.17)	1.00 (0.23–4.31)	0.59* (0.46–0.77) 14 (9–25)
>6 puffs/week	0.11 (0.01–2.02)	0.20* (0.09–0.46)	0.14 (0.01–2.63)	0.33 (0.01–7.68)	0.19* (0.09–0.40) 20 (17–33)
Used daily	Not estimable	0.14 (0.01–2.73)	Not estimable	Not estimable	0.14 (0.01–2.73) –

GASP Giving Asthma Support to Patients online tool

RR Relative risk

CI Confidence interval

NNT Number needed to treat

* Statistically significant difference between visit 1 and 2 GASP assessments with $p < 0.05$

provide details for the number of patients in each outcome, separated according to ethnic groups. Seven hundred and sixty-one consecutive patients, aged 5–64 years, provided complete data for 30 months using GASP. All patients had a minimum of two GASP assessments, with the mean time between assessments being 260 days. The number of GASP assessments per patient ranged from 2 to 9, with the mean number of assessments being 2.7.

Use of GASP reduced the risk of an exacerbation by 35% (relative risk [RR] 0.65; 95% confidence interval [CI] 0.56 to 0.76, with number needed to treat [NNT] 7); decreased hospital admissions by 33% (RR 0.67; 95% CI 0.44–1.00, with NNT 50) and ED presentations by 37% (RR 0.63; 95% CI 0.51–0.77, with NNT 10). Furthermore, use of the GASP tool significantly reduced the risk of patients requiring courses of oral corticosteroids by 34% (RR 0.66; 95% CI 0.56–0.78, with NNT 9). Use of GASP also increased the chance of patients not requiring SABA by 73% (RR 1.73; 95% CI 1.49–2.01, with NNT 6) and decreased the requirement for SABA of more than two puffs/week by 47% (RR 0.53; 95% CI 0.43–0.69, with NNT 11).

Tables 1 and 2 also show that the Asian and New Zealand European patients appear to benefit most from the use of GASP, with significant reductions in risk of exacerbations (RR 0.56; 95% CI 0.33–0.94 and RR 0.64; 95% CI 0.54–0.76, respectively) and SABA usage (not used: RR 1.82; 95% CI 1.14–2.93 and RR 1.68; 95% CI 1.43–1.98, respectively). Patients of New Zealand European ethnicity also showed a significant reduction in ED presentations, oral corticosteroid requirement, and decreases in weekly SABA use. Although Māori patients showed a significant decrease in ED presentations, no other outcomes were different for patients of either Māori or Pacific ethnicity.

How results were used to understand the problem

Previous studies are in agreement with our findings.^{24–27} A trial conducted in a primary care setting in Copenhagen showed that when internet-based monitoring of asthma was compared to that of general practitioner care alone, significantly

better asthma control was achieved with internet-based monitoring, with improvements seen in asthma symptoms, quality of life, lung function and airway responsiveness.²⁷

As the GASP online tool is an open-ended database, follow-up data as well as data on new patients will be entered continuously. Therefore, it is possible that longer-term effectiveness of GASP could be seen in data published at a later date. However, there is now a need for a randomised controlled trial in the primary care setting to confirm the findings of this retrospective cohort study. In the meantime, we believe that there is sufficient evidence from the current study to implement and utilise GASP in the management of asthma in all primary care practices in New Zealand.

Strategies for quality improvement/change

The strength of this study has been the careful development and constant updating of GASP over time, with every effort made to be certain that GASP is in accordance with current international practice guidelines. Additional strengths of this study include its 'real-life' setting, to ensure its usefulness in primary care, as well as all patient assessments being conducted by GASP-accredited nurses only. Furthermore, although patients were given a specified recall period, they were free to revisit the practice at any time if they believed that their asthma was not improving or was getting worse. Since there is no 'gold standard' for recall time period,²⁸ we believe it is better to have an open timeframe which gives the patient the possibility to assess their own asthma and request medical intervention if, and when, required.

Lessons and messages

This retrospective cohort study of the GASP tool has demonstrated that its use by health care professionals can significantly improve patient outcomes in the management of asthma in a primary care setting. There are important aspects to include when assessing patients with asthma and we believe that the use of GASP helps to structure this evaluation. The NNT was

calculated to be 7 for reducing exacerbations. Furthermore, this study suggests that for every 10 patients using GASP, one less patient would present to ED, and for every 9 using GASP, one less would require a course of oral corticosteroids. The introduction of the GASP tool was associated with improvements in multiple aspects of asthma care. Our study showed that the use of GASP resulted in closer monitoring, immediate feedback and adequate pharmacological and non-pharmacological therapy in accordance with current clinical guidelines, as well as better adherence to treatment. All of these factors together appeared to produce better asthma control, as evidenced by the improvements seen in the study outcomes.

Monitoring of symptoms, airflow obstruction, and exacerbations is essential to asthma management. Patients who practise self-monitoring, in conjunction with the use of a written action plan and regular medical review, have significantly fewer hospitalisations, ED visits, and lost time from work.²⁹ Either symptom monitoring or peak expiratory flow monitoring is satisfactory, provided the results are interpreted with reference to the patient's own baseline asthma status. Regular monitoring by health care providers also improves health outcomes for patients, provided the health care provider is systematic and monitors asthma control, medications, and patient skills at regular intervals. Additional monitoring tools may include online internet-based monitoring systems. It is important to monitor the quality and cost of care, as well as compliance with internationally accepted management guidelines. Assessment of the hospitalisation rate and regular audit may achieve these aims in the hospital setting. However, the best way to assess and monitor asthma in primary care remains an unresolved, yet crucial issue, since primary health care professionals manage the vast burden of illness caused by asthma.²⁹ Monitoring asthma outcomes is an essential step towards the successful implementation of international guidelines in the management of asthma. This study has shown that GASP provides a structure for a primary care asthma review and that it is quick and easy to use in a clinical practice setting. The key use of GASP is to act as a decision

support tool and to structure primary care asthma reviews, but it also covers important areas for the clinical assessment of asthma control in primary care. As such, it can be used to assess changes since the previous visit and the possible need for treatment update. GASP also provides a useful educational complement for both the patient and the health care provider, with data summaries at the individual level. It can also be used at a local practice or regional level to provide feedback on the asthma care provided to patients.

This study has shown that GASP provides a structure for a primary care asthma review and that it is quick and easy to use in a clinical practice setting

It was not altogether surprising in this study to find that Māori and Pacific patients appeared to gain the least benefit from the use of GASP. The burden of respiratory illness is significantly greater in these populations than in the New Zealand European population, with hospital admissions for Māori/Pacific people being twice that of New Zealand Europeans.^{30,31} Māori and Pacific people were also a smaller percentage (15%) of the population in the study catchment area, with the largest group being New Zealand Europeans (65%), followed by Asians (14%).³² Due to the burden of asthma in Māori and Pacific populations, the potential benefits afforded by the GASP tool need to be urgently investigated in these populations.

The results of this retrospective cohort study have shown that the use of GASP as the basis of a structured asthma review in primary care translates into significant clinical improvements. We believe that GASP is effective in assisting in controlling asthma and that future development and use of such a tool will benefit both patients and health care professionals. It is envisaged that greater numbers of general practices in New Zealand will implement the GASP tool as part of their routine asthma management plan, in order to further improve patient outcomes.

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COMPETING INTERESTS

None declared.

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