An algorithmic approach to diagnosing asthma in older patients in general practice

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ABSTRACT

What we need to know

- How effective would an algorithm be in helping general practitioners diagnose asthma?
- What proportion of older people with undiagnosed asthma fail to recognise symptoms?
- What proportion of the population believe asthma does not occur in the older population?
- What systems or supports do GPs need to diagnose asthma more effectively?

What we need to do

- Work on developing a gold standard for asthma diagnosis.
- Develop prototype algorithms for general practice discussion.
- Conduct a general practice study to assess the effectiveness of an algorithm.
- In conjunction with GPs, develop a pilot program to increase awareness of the current asthma problem.
- Conduct focus-group research to identify why some people do not believe they can develop asthma for the first time in adult life.
- Conduct focus-group research to identify why some adults do not attribute asthma symptoms to asthma.
- Conduct focus groups with GPs to identify what support is needed to diagnose asthma more effectively.
- Consult with all stakeholders before an intervention is used.
- Evaluate any interventions used.

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A recent study has estimated that the prevalence of undiagnosed asthma in the adult population is 2.3%,[1] and that this prevalence almost doubles in those aged over 65 years.[2] Given that patients whose asthma is undertreated have worse outcomes, recognition of people with undiagnosed and untreated asthma is important.[3] Although there is no Level I evidence[4] to support the idea, an algorithm to aid the early diagnosis and treatment of asthma in older people may improve their respiratory outcomes. For the purpose of this discussion, we define an algorithm according to *Stedman's medical dictionary* as a "step-by-step [written] protocol for management of a health care problem".[5] It is important to consider the issues associated with making an asthma diagnosis overall, and specifically in older people in whom other issues of ageing play a part, and whether these can be accommodated in an algorithm.

It is difficult to define asthma accurately. The definition of asthma by the Global Initiative for Asthma[6] includes inherent ambiguities (eg, "episodes are *usually* associated with widespread but *variable* airflow obstruction that is *often* reversible . . ."). Another issue is the lack of a gold standard for diagnosing asthma, which has implications for the sensitivity and specificity of the algorithm. However, this will be refined in future algorithms, and does not prevent us from using agreed best practice now.

International guidelines for the diagnosis and management of asthma suggest that a significant change in forced expiratory volume in 1 second (FEV_1) after use of a bronchodilator is indicative of asthma. However, the degree of reversibility of airflow restriction that is considered significant varies between guidelines, from 12% to 15% of the baseline value.[6,7] In addition, there is inconsistency between guidelines as to whether the post-bronchodilator response should be a percentage of baseline or of predicted FEV_1. There is also controversy surrounding the diagnostic value of the response to bronchodilator.[8] The UK National Institute for Clinical Excellence, in its recent guideline on chronic obstructive pulmonary disease (COPD), recommended a 400 mL increase in FEV_1 in response to bronchodilator as diagnostic of asthma.[9] Given the relative diagnostic uncertainty, the utility of an algorithm may be in providing a pathway for an approach to decision-making.

Several complex and possible contributory factors need to be considered in understanding why asthma is underdiagnosed in older people, and an algorithm may not be able to address this problem. Altered perceptions of dyspnoea have been described in older people,[10] and patients under-report symptoms to their doctor.[11] However, the proportions who dismiss their asthma symptoms as part of the normal ageing process, or deny that they have symptoms, or experience classical as opposed to non-classical symptoms of asthma, is unknown. These are barriers to presentation and not to diagnosis, and should be dealt with in health education campaigns.

Probably the most relevant issue to consider is the acceptability and utility to general practitioners of yet another diagnostic algorithm. After consultation with GPs to determine what would be useful, feasible and applicable in general practice, given their brief interactions with patients of all types, it was evident that GPs would use an algorithm as a reference tool rather than a day-to-day tool.[2] If an algorithm establishes improved decision-making in general practice for asthma diagnosis, it has served its purpose and does not need to be used on a daily basis.

GPs also related that they think in terms of "bundles" of information rather than in a linear (algorithmic) way. An algorithm developed from these consultations that attempted to accommodate this point made by GPs is shown in the Box.

Of equal importance, GPs were unaware of the reported level of underdiagnosis of asthma and felt strongly that being aware of this

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An algorithm to aid in diagnosing asthma in older people

History

Symptom check

Diagnostic questions to consider

- Do you think that your breathing is the same as it was when you were younger?
- In the past 12 months have you had:
  - An attack of breathing problems?
  - Wheezing or whistling in your chest when you did not have a cold?
- In the last 12 months have you woken at night with:
  - Feeling of chest tightness?
  - Shortness of breath?
  - An attack of coughing?
- Have you ever used any puffer medications (yours or anyone else's)?
- Are you a smoker or ex-smoker?
- Did you have any allergies as a child?
- What type of work have you done for most of your life?
- What are your hobbies?

COPD = chronic obstructive pulmonary disease.
* Possible reflux. † Such as fibrosis. ‡ Such as angiotensin-converting enzyme inhibitors, β-blockers.

Main differential diagnoses

	Asthma	COPD
Age at onset	Any age	Older
Allergy	Often	Sometimes
Sudden symptom onset	Often	Sometimes
Wheezing	Often	Sometimes
Dyspnoea	Often	Often
Coughing	Sometimes	Often
Smoking history	Sometimes	Almost always
Sputum production	Seldom	Almost always

Further differential diagnoses to consider

- Respiratory infection
- Pulmonary oedema
- Interstitial lung disease†
- Asthma as a comorbidity
- Anaemia
- Chronic cough*
- Congestive cardiac failure
- Malignancy
- Aspiration
- Medication‡

Making a diagnosis

Spirometry and trial of therapy

Post-bronchodilator obstruction ($FEV_1/FVC < 70\%$)	No			Yes		
Acute bronchodilator response (Improvement in $FEV_1 > 12\%$ and 200 mL)	Yes	Yes	No	No	Yes	No
Responsive to trial of therapy (eg, change in PEF > 20%)	Yes	No	Yes	Yes	No	No
Diagnosis	Asthma	Probable asthma		Possible asthma COPD		COPD

Other tests to consider

To exclude other diagnoses

- Chest x-ray
- Echocardiogram
- Blood tests (complete blood picture)
- Full lung function tests

COPD = chronic obstructive pulmonary disease.
FEV_1 = forced expiratory volume in 1 second.
FVC = forced vital capacity.
PEF = peak expiratory flow.
Assumptions: spirometry measures are valid and patient adheres to trial of therapy.

Trial of therapy

Considerations

Relative contraindications for oral steroids

- Diabetes
- Hypertension
- Glaucoma
- Tuberculosis
- Peptic ulcers
- Mood disorders

Spirometry and trial of therapy in older people can be influenced by social and economic factors as well as physical impairment

- Cognitive
- Visual
- Aural
- Musculoskeletal/coordination

Inhaled steroid option

- 500–1000 μg fluticasone propionate/day, 800–1600 μg budesonide/day, or equivalent (using a spacer where possible) for 4–8 weeks.

Oral steroid option

- 50 mg oral prednisolone/day for 10–14 days, with or without inhaled steroid.
- If benefits are observed, replace prednisolone with inhaled steroid and reassess.

Monitoring and reassessment

- Home peak expiratory flow monitoring, symptom diary, monitor activities of daily living.
- Review symptoms and spirometry when possible.
- Several visits may be necessary to confirm a diagnosis.

would make a difference to their approach. This consensus view is consistent with the National Asthma Campaign's "Could it be asthma?", an awareness program promoted to the community and health professionals. The program was associated with an increase in self-reported doctor-diagnosed asthma in adults from 5.6% in 1987 to 8.0% in 1990.[12] Information technology advances may make algorithms or pathways more relevant and acceptable to GPs in the future. Clinical technology advances, supported by evidence that they work in the relevant clinical setting, will need regular review and appropriate incorporation into practice.

Is it critical that an algorithm should be able to separate asthma from COPD? While treatment may seem to be similar for both diseases, at milder levels of disease there are differences in treatments and acute outcomes, and at all levels there are differ-

ences for prognosis. Thus, doctors should distinguish between asthma and other respiratory conditions.

It is important to consider the required elements of an algorithm, including symptoms and tests (Box). There have been efforts to determine the positive predictive values of symptoms, with diagnosis by a doctor as the gold standard. One study reported that wheezing associated with rest dyspnoea or nocturnal dyspnoea showed positive predictive values of 42% and 39%, respectively, for diagnosing asthma.[13] Thus, limitations of data in the literature must be considered in developing the algorithm. The medical history can provide an indication for the diagnosis at the level of *more likely or less likely* to support the diagnosis. Physical examination is less helpful and usually supports a "rule out" of more sinister diseases. Tests such as chest x-ray are important to rule out other diseases, and spirometry has limitations associated with access, acceptability of definitions of "reversibility", repeatability of bronchodilator response and quality. Determining the place of a therapeutic trial or other objective outcomes, such as functional limitations or activities of daily living, needs further work and evidence.

Conclusion

An algorithm for general practice would facilitate the use of the "step-by-step" logic or bundles of information needed in diagnosing asthma. We do not have the perfect approach to asthma diagnosis, but best current practice needs to be recommended. Working with GPs will determine the final format of the algorithm. Evaluation of the effectiveness of any algorithm is a critical developmental component.

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Competing interests

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References

1 Adams RJ, Wilson DH, Appleton S, et al. Underdiagnosed asthma in South Australia. *Thorax* 2003; 58: 846-850.
2 Wilson D, Adams R, Appleton S, Ruffin R. Review of literature, focus groups and workshops informing the approach to diagnosis of asthma in the older person. A report to the Australian Department of Health and Ageing. Adelaide: University of Adelaide, 2004.
3 Haahtela T, Jarvinen M, Kava T, et al. Comparison of a beta-2-agonist, terbutaline, with an inhaled corticosteroid, budesonide, in newly detected asthma. *N Engl J Med* 1991; 325: 388-392.
4 National Health and Medical Research Council. How to use the evidence: assessment and application of scientific evidence. Canberra: NHMRC, 2000.
5 Stedman's medical dictionary. 27th ed. eMedicine online medical dictionary. Available at: http://www.emedicine.com/asp/dictionary.asp (accessed Jun 2005).
6 Global Initiative for Asthma. Global strategy for asthma management and prevention. Washington, DC: National Institutes of Health; National Heart, Lung and Blood Institute, 2003. Updated 2004. NIH publication No. 02-3659. Available at: http://www.ginasthma.com (accessed Jun 2005).
7 Scottish Intercollegiate Guidelines Network and British Thoracic Society. British guideline on the management of asthma. *Thorax* 2003; 58 Suppl 1: i1-i94.
8 Calverley P, Burge P, Spencer S, et al. Bronchodilator reversibility testing in chronic obstructive pulmonary disease. *Thorax* 2003; 58: 659-664.
9 National Institute for Clinical Excellence. Chronic obstructive pulmonary disease. National clinical guideline on management of chronic obstructive pulmonary disease in adults in primary and secondary care. *Thorax* 2004; 59 Suppl 1: 1-232.
10 Parameswaran K, Hildreth AJ, Chadha D, et al. Asthma in the elderly: underperceived, underdiagnosed and undertreated: a community survey. *Respir Med* 1998; 923: 573-577.
11 van de Lisdonk E. Experienced and presented morbidity. *Scand J Prim Health Care* 1989; 7: 73.
12 Wilson D, Adams R, Appleton S, et al. Prevalence of asthma and asthma action plans in South Australia: population surveys from 1990 to 2001. *Med J Aust* 2003; 178: 483-485.
13 Sistek D, Tschopp JM, Schindler C, et al. Clinical diagnosis of current asthma: predictive value of respiratory symptoms in the SAPALDIA study. Swiss Study on Air Pollution and Lung Diseases in Adults. *Eur Respir J* 2001; 17: 214-219. ❑