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ORIGINAL RESEARCH

The availability and use of oxygen saturation monitoring in primary care in order to assess asthma severity

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KEYWORDS

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Summary

Introduction: The BTS/SIGN guideline recommends oxygen saturation (SaO_2) monitoring as an objective measure of acute asthma severity, particularly in children, in both primary and secondary care. We assessed the availability and use of SaO_2 monitoring for acute asthma assessment in primary care.

Methods: Fax and telephone questionnaire of Primary Care services in the Edinburgh region to assess use of SaO_2 monitoring in the past 24 months, in association with a 14-month retrospective assessment of A&E attendances with acute wheeze. Children over 12 months of age registered with eligible general practices attending A&E with wheeze and/or asthma were included.

Results: There were replies from 103 general practices (100%) and eight Out-of-hours cooperatives (100%). Oxygen saturation monitoring was available in four general practices (3.9%) and three Out-of-hours cooperatives (37.5%). 1408 children attended A&E with wheeze/asthma, 721 referred by primary care. Oxygen saturation monitoring was available to 7.9% of A&E attendees from primary care, but documented in only 1.8% of primary care referrals.

Conclusions: SaO_2 monitoring is not widely available in primary care and is infrequently used for the assessment of acute asthma. SaO_2 measurement as an adjunct to clinical assessment of asthma in primary care needs encouragement.

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Introduction

The British Thoracic Society guidelines on asthma management published in 1997 [1] were generally well received and implemented. An important section of the guidelines concerns the management of acute asthma exacerbations. Determining the

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severity of an asthma exacerbation can be difficult, particularly in children. Oxygen saturation (SaO_2) is an objective measurement that can assist clinicians in deciding therapeutic options in acute asthma, thereby helping to identify those in need of more intensive treatment. A fall in the oxygen saturation level to $<92\%$ corresponds to a position on the oxygen dissociation curve at which there is the potential for a rapid fall in arterial partial oxygen pressure. Knowledge of oxygen saturation values can therefore identify those at risk of significant hypoxia [2].

Updated British Thoracic Society (BTS)/Scottish Intercollegiate Guidelines Network (SIGN) guidelines for the management of asthma have recently been published [3]. Although the earlier 1995 guidelines recommended that SaO_2 monitoring be available in all areas treating patients with acute asthma, implying that primary care should be included [1], the recent BTS/SIGN guidelines have been more explicit in recommending that SaO_2 monitoring be available in both primary and secondary care [3]. Measurement of SaO_2 has been given lead prominence in flowcharts intended to aid the assessment of acute asthma in children. Evidence for the use of SaO_2 monitoring in primary care extends from secondary care Accident and Emergency (A&E) departments, where it is ubiquitously used [4], and is supported by confidential enquiries into asthma deaths which have reported medical difficulties in appreciating acute disease severity [5].

Our aim was to assess the availability of SaO_2 monitoring in primary care in our region, and its use in children referred to hospital with asthma exacerbations.

Methods

Telephone and fax questionnaires were sent to all 103 general practices and eight Out-of-hours (OOH) co-operatives that serve the population of Edinburgh and East and Mid Lothian, to assess the availability of SaO_2 monitoring equipment. Information on the presence of an SaO_2 monitor, and its purchase date, were requested from either a general practitioner (GP) or asthma nurse in each practice. It was also confirmed whether or not SaO_2 monitoring equipment, if present, was available to all clinicians in the practice.

A hospital patient database search identified all children aged 1–16 years who attended our paediatric A&E department in the previous 24 months with 'wheeze' or 'asthma'. Children were only included if they arrived from one of the 103

study practices within the area (or the nominated OOH service). Children arriving from primary care were considered to have been referred by their own GP if they arrived between 0900–1900 Monday to Friday, and to have been referred from their allocated OOH service at all other times. Children referred by their GP or OOH service where SaO_2 monitoring was available were identified, and the referral letter was assessed for reference to SaO_2 measurement. The triage status of patients arriving to A&E with wheeze/asthma was also assessed, to ascertain any bias in referral that might occur from the use of SaO_2 in primary care.

Results

Replies were received from all 103 general practices (100%) and eight OOH cooperatives (100%). SaO_2 monitoring was available in four general practices (3.9%) and three OOH cooperatives (37.5%), and had been available for a median period of two years (range 0.5–3).

In the 24-month review, there were 1408 A&E attendances of children with wheeze or asthma. Six hundred and eighty-seven (48.8%) were self-referrals and 721 (51.2%) were referrals from primary care - 392 from general practices and 329 from OOH co-operatives. 7.9% of attendees arrived from a primary care service with SaO_2 monitoring available - 14 from general practices and 43 from OOH services. Thirteen patients had reference to oxygen saturation in referral letters (1.8% of all primary care referrals): this was more common in OOH referrals (12 of 43 letters, 28%) than in GP referrals (1 of 14 letters, 7%). The median SaO_2 quoted was 94% (interquartile range 92–95), and four children were referred with an $\text{SaO}_2 \leq 92\%$.

The triage status of patients arriving from those primary care services with and without SaO_2 monitoring available were generally similar, implying that milder patients were not being managed in the community following reassurance by SaO_2 readings - see Table 1. More patients arrived from A&E in triage status 1 from practices with SaO_2 monitoring, which may imply a more targeted referral from these practices, though numbers were small. Test of association of triage status from those practices with and without SaO_2 monitoring demonstrated a non-significant relationship (Chi Squared 5.04, $p > 0.05$).

Discussion

This study identifies that SaO_2 monitoring equipment is not widely available in primary

Table 1 Triage status of patients arriving at A&E with acute asthma or wheeze

Triage status	Primary care with SaO ₂ monitoring		Primary Care without SaO ₂ monitoring		Self referral	
	N	%	N	%	N	%
1	2	3.5	4	0.6	7	1.0
2	3	5.3	40	6.0	69	10.0
3	25	43.9	286	43.1	249	36.2
4	27	47.4	334	50.3	362	52.7
Totals	57		664		687	

Triage status 1 = most urgent, triage status 4 = least urgent.

care, and even when available it is frequently not used for the assessment of asthma. Whilst these results relate to one region, it is likely, given the lack of central initiatives to supply primary care with oxygen monitoring equipment, that the results are applicable to other areas in the UK.

Studies on the use of oxygen saturation monitors in primary care for assessing acute asthma have not previously been reported. One report from Finland identified that 81% of primary care practices had saturation monitors available, but there was no mention of how often these were used for the assessment of acute asthma [6]. Though many GPs would consider oxygen saturation monitors to be expensive and bulky, small SaO₂ monitors are now available for approximately £300 and consequently cost may not be a significant reason for poor availability. However, in this study, even when SaO₂ equipment was available, SaO₂ monitoring did not appear to be a regular part of acute asthma assessment. Obtaining an SaO₂ level is one of the first tests performed on all children arriving at an A&E department with acute asthma. GPs may therefore need targeted training to help them appreciate this practice development. The primary reason given for SaO₂ monitor purchase in many practices was for the management of patients with chronic obstructive pulmonary disease (COPD). It is interesting to note that, where available, SaO₂ was more likely to be used by referring OOH services (28%) than by GPs (7%).

Primary care management of acute asthma is given significant prominence in the UK BTS/SIGN asthma guidelines [3]. Such prominence is not as evident in guidelines from other countries – for example, the USA [7] and Canada [8]. This may either reflect a different model of healthcare, or in some cases a missed opportunity to provide important information to primary care practitioners on the early management of acute exacerbations.

Successful guidelines depend upon widespread implementation. The BTS/SIGN asthma guideline

[3] has recommended a form of clinical assessment for acute asthma, SaO₂ monitoring, that is not available to the majority of GPs in the UK. GPs could argue that the evidence for the use of oxygen saturation monitoring in primary care is not available, and consequently that the use of such monitoring in primary care should not be given such prominence in an evidence-based guideline. Others may argue that the body of evidence in the primary-secondary interface of A&E is sufficient to warrant inclusion. When developing guidelines sufficient care should be given to the assessment of how well they may be implemented [9]. In recommending an assessment tool that is not widely available, the current asthma guidelines may disenfranchise a significant proportion of GPs and reduce the effectiveness of their implementation [3]. One might hope, however, that the BTS/SIGN guideline might encourage the use of SaO₂ monitoring as an objective adjunct to the clinical assessment of asthma in primary care.

Conflict of interest

There are no existing or potential conflicts of interest to be declared.

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