

## Research Article

# Assessing the Quality of Clinical Care for Children with Chronic Wet Cough Prior to Respiratory Specialist Consultation: Targets for Improvement

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**ABSTRACT**

**Background:** Childhood chronic wet cough is associated with poor health outcomes and increased health service utilisation, however little is known about the quality of primary care currently provided.

**Aim:** To assess the quality of care provided to children with chronic wet cough prior to referral to a respiratory specialist physician.

**Design:** Prospective cross sectional study.

**Setting:** Paediatric respiratory specialist clinics in Brisbane, Australia at (a) Lady Cilento Children's Hospital, a public tertiary facility and (b) Wesley Hospital, a private facility.

**Participants:** Children newly referred to a paediatric respiratory specialist between July 2015 and January 2017 with a history of chronic (>4 weeks) wet cough of unknown aetiology.

**Main outcome measure's:** The quality of pre-respiratory specialist care was assessed against a 10-item quality indicator tool where a score of 0 reflects poor care and 10 reflects high

quality care. The quality indicator tool encompassed both clinical care and referral practices.

**Results:** The median age of 110 children enrolled was 1.9 years (IQR 1.2, 4.1). Children had a history of coughing illnesses for a median of 53.2 weeks (IQR 24.9, 127.6) prior to receiving a referral to a respiratory specialist. The quality indicator score rated for referrals was median 6 (IQR 5, 8), with 48% referrals from general practitioners scoring between 0-5. Main indicators of poor care were the inappropriate use of antibiotics and delayed specialist referral practices.

**Conclusion:** Children referred for specialist care were young and had a long history of coughing illness. Based on a quality indicator tool the preliminary care provided prior to referral is poor. Barriers to improving pre-specialist care need to be evaluated and include targeted education, particularly for primary care physicians.

**Keywords:** Children; Cough; Quality improvement; Primary care; Australia.

## Introduction

In Australia cough is the leading cause for acute general practice consultations [1]. It is unknown what proportion of these consultations are for chronic wet cough. Improving the clinical care of children with chronic cough (>4 weeks duration) is necessary for early diagnosis and management and in doing so, preventing disease progression (e.g. bronchiectasis) [2]. Effective treatment (i.e. quality care) also reduces the duration of cough which improves the quality of life and overall burden of illness on families and the healthcare system [3,4]. Further, as chronic wet cough is associated with multiple doctor visits [3] (thus health service utilisation) there is an increasing appreciation of the need to improve the care of children with chronic wet cough [5].

The spectrum of illnesses associated with chronic wet cough are diverse ranging from the relatively benign and easily treatable at the primary care level, through to life threatening illnesses that require specialist intervention. National and international cough guidelines exist to aid clinicians to investigate and make treatment decisions [6,7]. The extent to which these guidelines are utilised by physicians, especially within the primary care setting, is unknown. However studies at the respiratory specialist level found that misdiagnosis and subsequent inappropriate medication prescription [8] and frequent medical consultations [3] are not uncommon in children with chronic wet cough.

Like many countries, health expenditure in Australia is disproportionate to population and economic growth [9]. In response to the increasing burden associated with chronic illnesses, the Australian Government has released the National Strategic Framework for Chronic Conditions [10]. This framework seeks to prevent chronic disease and where possible limit disease severity and progression. Improvements in the quality of care provided to patients, namely the timely and appropriate detection and intervention of chronic illnesses, is a key strategy of this framework [10]. Currently, there is no published data on the quality of care provided at the pre-subspecialist level to children with chronic wet cough.

As unwarranted variation in care is associated with poorer patient outcomes and increased health service utilisation [11], there is a need to better understand whether variation in care occurs in children with chronic wet cough, one of the most common reasons why children are referred to respiratory specialists. Assessing quality of care requires 'quality of care indicator tools', otherwise known as 'review criteria' [12]. These can be applied to evaluate and monitor the quality of care [13], identify inefficiencies in clinical practice and lead to the development of quality improvement intervention points. Using a tool we previously developed centred on a Delphi-based method, we assessed the management of 110 children with chronic wet cough prior to their review by a respiratory physician in two Brisbane hospitals.

## Methods

### Study design and subjects

The study was undertaken in Brisbane, Australia between July 2015 and January 2017 at 2 sites: (a) the Lady Cilento Children's Hospital, a public tertiary facility, and (b) the rooms of a private paediatric respiratory specialist at the Wesley Hospital. The study was approved by Children's Health Queensland Human Research Ethics Committee (HREC) (HREC/03/QRCH/17), Uniting Care HREC (HREC #1418), Queensland University of Technology (QUT) HREC (140000072). The Department of Human Services External Review Evaluations Committee (MI9778) approved the release of Medical Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS) records.

All referrals to the centres were screened. Parent(s)/carer(s) were contacted and enrolled prior to the child's first consultation with a paediatric respiratory specialist. Inclusion criteria were: (a) children aged <16 years newly referred to a paediatric respiratory specialist for chronic wet cough (>4 weeks) and; (b) not currently under the care of a respiratory physician. Exclusion criteria were a history of chronic dry cough or known aetiology of cough such as cystic fibrosis. Consent to participate was obtained from a parent or legal guardian and, where >13 years of age and sufficient maturity, assent was obtained from the child. Consent included access to the child's Australian Government medical subsidy records including the MBS and PBS data.

### Data collected

Data collected at point of enrolment included referral letters, patient and family demographics, current and previous medical history, investigations and treatments received. We also used the children's MBS and PBS records for the 12 months prior to enrolment which included healthcare utilisation data of consultations, prescription medications and investigations.

### Evaluation of quality of care

The overall quality of care was assessed using of a 10-item quality of care indicator tool (Table 1). An original 10 item indicator tool was developed and underwent a Delphi consensus to elicit expert opinion from 22 paediatricians or respiratory specialists as to what reflects good primary health care, prior to referral. Specialists were currently practicing and highly experienced with 324 cumulative years of paediatric respiratory experience and 504 years of total clinical practice supporting their judgements. In the Delphi process, the mean agreement for all items of the tool was 97%. Based on expert feedback a modified version of the indicator tool was applied to this study that further took into consideration the duration of the child's cough and combined the 'excessive' use of oral and inhaled corticosteroids into one item.

Using the data collected above, the pre-respiratory specialist care of each child was independently reviewed by a paediatric respiratory physician and senior respiratory nurse. Information utilised to score the quality of care included referral letter, children's MBS and PBS records, parent reported medical history and cough management, and respiratory physicians notes from first consultation. Any item that was marked as

**Table 1:** Quality indicator audit tool used to determine optimization of care for children with chronic wet cough.

1. The child has been trialed on a course of antibiotics for their chronic wet cough.
2. The antibiotics trialed for their chronic wet cough were an appropriate type (*either Amoxicillin clavulanic acid or Trimethoprim/sulfamethoxazole or others when allergy exists*).
3. The antibiotic trialed for their chronic wet cough was for an appropriate duration (*minimum 2 weeks*).
4. The child has had a chest X-ray and, if >6 years old has also had spirometry.
5. The child did not receive more than one course of oral steroids and/or did not receive inhaled corticosteroids (ICS) for >4 weeks for the treatment of their chronic wet cough (*unless a specialist has confirmed a concurrent asthma diagnosis*).
6. The child has been referred or investigated accordingly if 'cough pointers' exist.
7. The child did not see the physician more than 3 times for their current cough prior to referral.
8. The child was referred to appropriate subspecialists sequentially and was not referred to multiple specialists concurrently.
9. The quality of the referral received was sufficient enough to allow for appropriate triage, including at least 3 of the following: *Cough duration / Nature of cough / Medications used and responsiveness to medications / Any underlying disease / Any cough pointers identified*.
10. The child was not coughing for >3 months prior to referral.

having been achieved was given a point. Points were then added to give a total overall score for each child out of 10, with 10 reflecting best quality care.

### Statistical analyses

Descriptive statistics were used to describe demographic and clinical characteristics with results reported as medians and inter-quartile range (IQR). Analysis was performed using statistical package SPSS version 23.

### Results

Of the 118 families approached, 5 declined to participate and 3 consented but did not enter protocol as they had a dry cough which parents had misinterpreted as wet. Table 2 shows the enrolment characteristics of the 110 children. On the day of enrolment children had been coughing continuously for a median of 12 weeks (IQR 2, 33.4). Health utilisation reflected by doctor visits was high; >80% of children had  $\geq 5$  medical consultations, and >50% had  $\geq 10$  consultations in last 12 months; 40% had  $\geq 20$  medical consultations over their life for coughing illness. Cough onset occurred within the first month of life for 26 children (24%) and 29% of children had a >2 year history of coughing illness. In addition to antibiotics, parents reported children were treated with other medications for their cough including bronchodilators (66%), oral steroids (56%), and inhaled corticosteroids (30%). Over half of the children had used over the counter medications for their cough.

The median quality of care indicator score (Figure 1) was 6 (IQR 5, 8). Of the children who were referred by a general practitioner 48% scored  $\leq 5$ , in comparison to 24% for children who were referred by specialists. Results of each indicator item are represented in Figure 2. The quality of care indicator items with the lowest scores were that related to the type (QI 2) and duration (QI 3) of antibiotics prescribed as well as the excessive amount of consultations (QI 7) and duration of cough prior to appropriate referral (QI 10) (Figure 2).

### Discussion

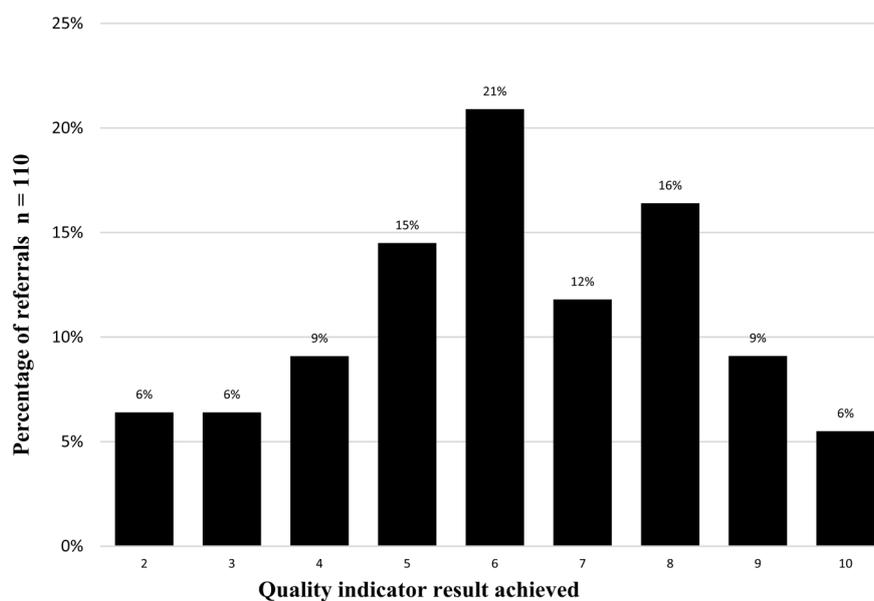
In this first study to evaluate the quality of care for children with chronic wet cough prior to respiratory specialist review, we found there is substantial variation in the care of these children. Using a quality indicator tool, we found that children referred by a general practitioner were twice as likely to receive sub-optimal care (total score  $\leq 5$ ) compared to children referred by a subspecialist paediatrician. The quality indicators with the lowest scores (i.e. poorer management) were antibiotic prescribing patterns and delayed referral practices (i.e. child seen <4 times prior to referral). Given first line treatment of chronic wet cough is at the primary care level, identifying the extent of clinical practice variation is important to improve patient outcomes and reduce unnecessary strain on the healthcare system.

In our study the majority of children had been given a trial of antibiotics which is appropriate for chronic wet cough (>4 weeks duration), however for many, they were prescribed an inappropriate type or for an inadequate duration. Clinical guidelines suggest for children with chronic wet cough and no other signs or symptoms suggestive of an alternative diagnosis, known as 'cough pointers', a minimum of two weeks of antibiotic therapy (reflecting local respiratory bacteria and resistance patterns) are used as first-line therapy [6]. This is recommended because protracted bacterial bronchitis (PBB) is the most common cause of chronic wet cough reflecting lower airway infection and inflammation [14-16]. Importantly PBB is likely linked with bronchiectasis [2], a condition associated with increased morbidity [17] and mortality in children and adults [18]. Early and appropriate treatment of the underlying infection in PBB, prevents the ongoing airway infection (and subsequent inflammation) and disease progression. Hence, although cough guidelines [6,7] exist to aid clinicians in this decision making process, our research suggests that there is a need for improved awareness and education regarding the appropriate antibiotic type and length of treatment for children with chronic wet cough.

**Table 2:** Enrolment characteristics of the 110 children.

Characteristics of cohort (N=110)	N (%)
Age*	1.9 years (1.2, 4.1)
Sex (male)	72 (65.5)
<b>Duration of cough (weeks)</b>	
History of cough as a problem*	53.2 (24.9, 127.6)
<b>Referring doctor</b>	
General practitioner	59 (53.6)
Paediatrician	29 (26.4)
Department of emergency medicine	16 (14.5)
Paediatric allergist	4 (3.6)
Paediatric otolaryngologist	1 (0.9)
Paediatric gastroenterologist	1 (0.9%)
Referral to respiratory specialist requested by parent	31/104 (29.8)
Previous requests for a referral had been denied	25/91 (27.5)
Antibiotic courses prescribed/person in past 12 months*	4 (2, 6)

\*Results reported as median (IQR)



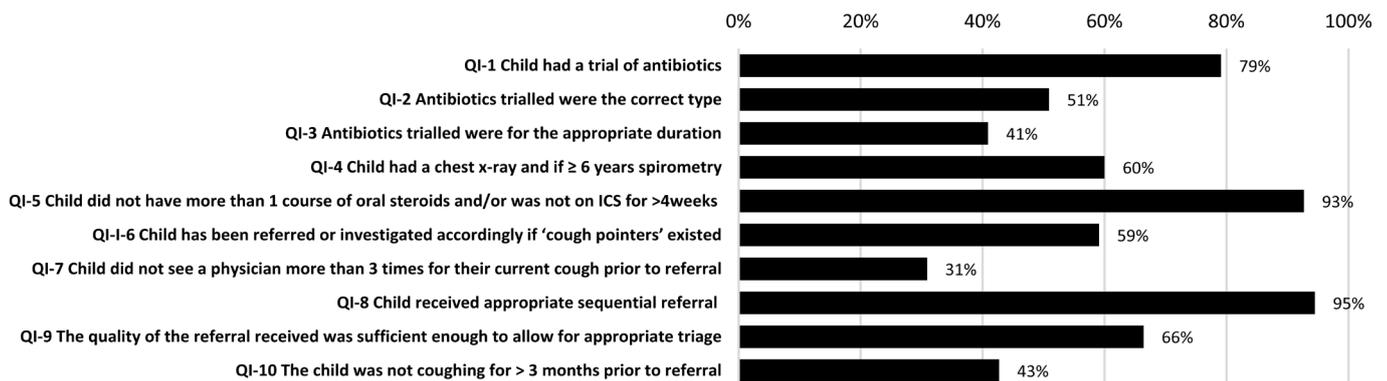
**Note:** Clinicians did not score below 2 on the quality indicator tool thus (1) has been purposefully omitted from this graph.

**Figure 1:** Results of the application of a quality indicator tool for the management of children with chronic wet cough out of a possible score of 10.

A delay in referral for specialist review is another possible intervention point when considering mechanisms on improving the quality of care. Guidelines suggest referral to a specialist for further investigation is warranted when the cough persists after antibiotics have been trialled for a minimum of 2 and maximum of 4 weeks as failure of chronic wet cough to respond to 4 weeks of appropriate antibiotics predicts the presence of bronchiectasis (adjusted odds ratio of 20.9, 95%CI 5.4-81.8) [19]. However within our study the referral was delayed in many cases, with over half (57%) of children coughing for > 3 months before being referred to a respiratory specialist. It is likely that a failure of clinicians to identify a chronic wet cough as a ‘cough pointer’

and symptom requiring specific intervention and investigation contributes to such a delay (Quality Indicator 6). Delayed referral is a clinical concern in cases where urgent medical attention is needed, such as a retained airway foreign body [20]. Furthermore the ongoing chronic cough from a delayed referral continues to impact on quality of life, which has been shown to improve with symptom resolution [4]. Owing to this burden associated with the presence of chronic cough, it is not surprising that a third of referrals in our study were initiated due to parental requests.

In addition, >40% of the children were referred by specialists, rather than GPs, which highlights the need for improved quality



**Figure 2:** Percentage of quality indicator scores achieved per item.

of care at general practitioner level; sixteen (14.5%) children were referred through the emergency department (ED), suggesting sub-optimal primary care of these children. These findings are supported by a recent study [21] which found that presentations to the emergency department for chronic wet cough were not uncommon. O'Grady et al. evaluated 875 children presenting to ED with cough and found that 63 (7.5%) children had already been coughing for >28 days at time of presentation [21]. In that study, 171 (20.4%) children were still coughing 28 days post initial presentation, a respiratory specialist consultation was undertaken and found that 55 (47%) of children had PBB, whilst more serious chronic respiratory infections including bronchiectasis were present in 44 (37.6%) of children [21]. Such results indicate that the primary care management of children with chronic wet cough is yet to be optimised and primary care education regarding appropriate referral practice is warranted.

Our quality indicators were predominantly developed based on the current evidence-based cough guidelines [6], and hence the optimum care of children with chronic wet cough. The guidelines however is not specific to the nuances of first-line care and referral. Specialist referral is advocated upon initial treatment failure, though at present no guidance is provided as to specifically when and to whom referral should be made, nor the details necessary to be included within the referral letter. As such our quality indicator tool was supplemented with additional items pertaining to referral practices drawn from the literature [22,23]. By further adopting a Delphi-method to elicit expert opinion we were able to obtain strong consensus for all quality indicator items (mean agreement 97%) which contributes to the strength of this tool. Our quality indicators therefore reflect the most effective and efficient first line management for children with chronic wet cough.

Our study has several limitations. Firstly, it was undertaken in a large Australian city and hence is representative of a specific subset of the population. Subsequently the results may not translate to other populations, particularly areas outside capital cities, which experience considerable differences in health resources. Secondly, the applicability of items within the quality indicator tool are context specific and may not be relevant for all involved in the pre-respiratory specialist care of children with chronic wet cough, such as emergency medicine physicians who are not involved in long-term management. Thirdly, although

our tool was developed using evidence based guidelines [6] and had strong expert agreement, the tool was predominantly based on the opinions of paediatric respiratory specialists and not general practitioners or families. Lastly, although this was a prospective study, we were reliant on some parental history and review of the clinical notes after enrolment. However the potential limitation this presented was minimised by use of the MBS and PBS data to support these historical findings.

## Conclusion

Our study found that the current quality of pre-respiratory specialist care of children with chronic wet cough is sub-optimal when measured using a quality of care indicator tool in a subset of children in Australia. To improve the quality of care for children with chronic wet cough, the intervention points most likely to make a difference are ensuring the correct antibiotic is prescribed for the correct duration, and improvement in the timeliness of referral to a specialist, as these had the lowest scores. Future research should focus on barriers to the uptake of clinical practice guidelines during the first line management of children with chronic wet cough, as well as strategies to improve education highlighting identified deficiencies in clinical practice.

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