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## Original Article

# Quality indicators for treatment of respiratory tract infections? An assessment by Danish general practitioners

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### KEY MESSAGE:

- Danish GPs prefer quality indicators focusing on the frequency of prescribing of narrow-spectrum penicillin, which is the choice of drug for treatment of respiratory tract infections in Denmark.
- GPs who disagreed on most of the quality indicators prescribed more macrolides and less narrow-spectrum penicillin than the GPs who agreed on the majority.

### ABSTRACT

**Background:** In 2008, a set of 41 quality indicators for antibiotic treatment of respiratory tract infections (RTIs) in general practice were developed in an international setting as part of the European project HAPPY AUDIT.

**Objectives:** To investigate Danish general practitioners' (GPs') assessment of a set of internationally developed quality indicators and to explore if there is an association between the GPs' assessment of the indicators and their practice characteristics as well as their antibiotic prescription pattern.

**Methods:** A total of 102 Danish GPs were invited to assess the 41 quality indicators. The GPs were categorized into two groups according to their assessment of indicators. Data concerning practice characteristics and antibiotic treatment were obtained during a three-week registration of patients with RTIs and were linked to the GPs' assessments of the indicators.

**Results:** A total of 62 (61%) responded. Quality indicators focusing on the frequency of prescribing of narrow-spectrum penicillin were rated as suitable by more than 80% of the Danish GPs, while quality indicators concerning cephalosporins or quinolones were rated suitable by less than half of the GPs. The antibiotic prescribing pattern differed significantly and the GPs who disagreed on most indicators prescribed more macrolides and less narrow-spectrum penicillin than the GPs who agreed on most indicators.

**Conclusion:** Even though an international expert panel agreed on a set of quality indicators for antibiotic treatment of RTIs, only a few of them were rated suitable by the GPs, who are supposed to use them.

**Key words:** Quality indicator, quality improvement, general practice, respiratory tract infection, antibiotics

### INTRODUCTION

During the last decades, an extensive focus has been on improving the quality of care in general practice (1–3). Many of the quality improvement initiatives involve the introduction of indicators, and for instance in the UK there has been an attempt to enhance the quality in general practice through financial rewards based on fulfilment of indicators (4). Indicators are defined as specific and measurable elements of practice, for which there is

evidence or consensus that they can be used to assess the quality, and hence change in the quality, of care provided (5). It is of major importance to acknowledge the fact that quality indicators ought to be used only for guidance and cannot on their own provide definitive evidence of success or failure, and they should be used to raise questions, not provide answers (6). It is a drawback that quality indicators only assess easily measurable aspects of care and fail to encompass the more subjective aspects

of general practice (7). Some general practitioners (GPs) address the indicator orientation as a threat to patient-centred care and fear of loss of autonomy by the introduction of indicator-based practice (8).

The increasing problems with antibiotic resistance due to inappropriate and excessive use of antibiotics are of great concern worldwide (9,10). Respiratory tract infections (RTIs) account for a considerable proportion of contacts in general practice and the quality of antibiotic treatment of RTIs in general practice is much debated (11,12).

In 2008, 4 authors of this study (MPH, LB, BGH, DEJ) conducted a Delphi survey with the aim of developing a set of quality indicators for diagnosis and treatment of RTIs in general practice (13). The quality indicators were developed in an international setting and involved an expert panel comprising 27 experts from 13 countries. The panel consisted of 19 GPs, 4 clinical microbiologists, 2 clinical pharmacologists, 1 full-time senior researcher (MD) and 1 pharmacist. Some 59 quality indicators were rated by the panel of experts, and a total of 41 attained a predefined consensus after two Delphi rounds. The set of 41 quality indicators were intended to strengthen GPs' focus on their management of patients with RTIs and to identify inappropriate antibiotic prescription patterns for RTIs in general practice. A successful implementation of quality indicators requires, however, that GPs find the indicators relevant and suitable for their daily work in practice.

In the present study, the aim was to investigate Danish GPs' assessment of a set of internationally developed quality indicators for antibiotic treatment of RTIs in general practice. Furthermore, we wanted to explore if there was an association between the Danish GPs' assessment of the quality indicators and their practice characteristics as well as their antibiotic prescribing pattern. The hypothesis was that GPs who were negative towards quality indicators dealing with antibiotic treatment were more likely to prescribe antibiotics and, furthermore, chose inappropriate antibiotics than other GPs. We are not aware of any previous study that has investigated this relevant issue.

## METHODS

### *Setting*

The study was part of the EU-funded project HAPPY AUDIT with the overall focus of lowering bacterial resistance by reducing prescribing of unnecessary antibiotics for RTIs and by improving the use of appropriate antibiotics in suspected bacterial infections (14). The project involved GPs from Denmark, Sweden, Lithuania, Russia, Argentina and Spain, and details dealing with the entire EU project are described in the study protocol (15).

A total of 1971 Danish GPs out of 3646 GPs were invited randomly by letter to participate in the HAPPY AUDIT project (16). 102 Danish GPs accepted to participate in the project, and they were all invited to assess a set of 41 newly developed international quality indicators for antibiotic treatment of RTIs (13). To ensure sufficient knowledge of Danish GPs about quality indicators, they were provided with basic information about the objective and interpretation of a quality indicator (7). Moreover, they were thoroughly informed about the assessment procedure and an example was given to ensure that the GPs understood that they were asked whether the quality indicators would make a good assessment tool and not if they agreed in advice of treatment.

The quality indicators were classified according to the International Classification of Primary Care (ICPC) into groups concerning: Acute sinusitis, acute otitis media (AOM), acute tonsillitis/pharyngitis, acute bronchitis, pneumonia and exacerbation of chronic obstructive pulmonary disease (COPD) (17). Some quality indicators were aggregated according to the NICE guidelines in lower respiratory tract infection (LRTI) comprising acute bronchitis, bronchiolitis, pneumonia and tracheitis and in RTIs comprising any infectious disease of the upper or lower respiratory tract (18). The quality indicators were originally developed in English, and a standardized forward-backward translation was consequently performed translating the quality indicators into Danish (19).

### *Outcomes and analysis*

The Danish GPs' assessments of the set of internationally developed quality indicators took place during November and December 2008. For each of the 41 quality indicators, the GPs were asked to state their agreement with the following statement: 'This quality indicator is suitable for assessing the quality of my daily work.' A four-point Likert scale ranging from 1 (= completely disagree); 2 (= disagree); 3 (= agree); to 4 (= completely agree) was used. The percentage of GPs that found the quality indicator suitable, defined as  $\geq 3$  on the four-point Likert scale, was calculated for each of the quality indicators.

Data concerning the Danish GPs' personal data, practice characteristics and the antibiotic treatment of patients with RTIs were obtained during a three-week registration in January–February 2008. Patients with RTIs were registered according to the Audit Project Odense method using a prospective self-registration method based on a chart completed by the GPs (20). The GPs were recommended to fill in the registration chart immediately after each patient contact, and furthermore, they were asked to complete a GP questionnaire focusing on personal information and practice characteristics. Details

of the registration procedure have previously been described (15).

The GPs were categorized into two groups according to their assessment of the quality indicators. One group comprising GPs who agreed that more than 50% of the quality indicators were suitable for assessing the quality of their daily work and another group comprising GPs who believed that  $\leq 50\%$  of the 41 quality indicators were suitable. For each group, we tabulated their practice characteristics and antibiotic prescriptions for patients with RTIs by means or percentages, with 95% confidence intervals (95% CI). The practice characteristics of the two groups of GPs were compared by using a two-sample test of proportion for percentages and a two-sample t-test for means.

Using a chi-squared test, we compared the prescribing patterns, i.e. the distribution of the different kinds of antibiotics between the two groups of GPs. Data was analysed using Stata version 10.0 (21).

## RESULTS

Of the 102 GPs who were invited to participate, 62 responded (61% response rate). Four replies were

excluded from the analysis due to missing identification of the GP, and this resulted in a total of 58 analysed responses. No notable differences in practice characteristics, number of antibiotic prescriptions for RTIs or in the choice of antibiotics of responders and non-responders were found (data not shown).

### Assessment of the quality indicators

Tables 1 and 2 demonstrate the Danish GPs' assessments of the 41 quality indicators for antibiotic treatment of upper and lower RTIs, respectively. None of the quality indicators was assessed to be suitable by all 58 GPs as a good assessment tool for evaluating the quality of antibiotic treatment of patients with RTIs. A distinctive feature of the assessment was that all quality indicators focusing on the frequency of prescribing of narrow-spectrum penicillin were rated suitable by more than 80% of the Danish GPs. On the contrary, less than half of the GPs assessed the quality indicators focusing on the frequency of prescribing of cephalosporins or quinolones suitable. The largest number of GPs (91%) agreed on the quality indicator: 'Proportion of patients with acute tonsillitis/pharyngitis and a positive StrepA treated with antibiotics,' while 86% of the GPs found that the quality indicator

Table 1. The number of Danish GPs who agreed on the relevance of the quality indicators for upper respiratory tract infections as an assessment tool.<sup>a</sup>

Quality indicators	Number of GPs <sup>b</sup> <i>n</i> = 58
Patients with acute sinusitis:	
Proportion treated with narrow-spectrum penicillin	48 (83)
Proportion treated with antibiotics	36 (62)
Proportion treated with broad-spectrum penicillin $\pm$ clavulanic acid	28 (48)
Proportion treated with macrolides	28 (48)
Proportion treated with cephalosporins	21 (36)
Proportion treated with quinolones	19 (33)
Patients with acute otitis media:	
Proportion with discharging ear treated with antibiotics	50 (86)
Proportion treated with narrow-spectrum penicillin	48 (83)
Proportion of patients $< 2$ years treated with antibiotics	42 (72)
Proportion treated with antibiotics	37 (64)
Proportion treated with broad-spectrum penicillin $\pm$ clavulanic acid	36 (62)
Proportion of patients $> 2$ years with less than three days of symptoms of AOM with antibiotics	35 (60)
Proportion treated with macrolides	31 (53)
Proportion treated with cephalosporins	22 (38)
Proportion treated with quinolones	22 (38)
Patients with acute tonsillitis/pharyngitis:	
Proportion with a positive StrepA test treated with antibiotics	53 (91)
Proportion treated with narrow-spectrum penicillin	50 (86)
Proportion treated with antibiotics	31 (53)
Proportion treated with broad-spectrum penicillin $+/-$ clavulanic acid	25 (43)
Proportion treated with macrolides	25 (43)
Proportion treated with cephalosporins	22 (38)

AOM, acute otitis media; StrepA test, rapid Streptococcus A antigen detection test.

<sup>a</sup>GPs who rated the quality indicator  $\geq 3$  on a four-point Likert scale.

<sup>b</sup>Data presented as *n* (%).

Table 2. The number of Danish GPs who agreed on the relevance of the quality indicators for lower respiratory tract infections, respiratory tract infections in general and exacerbation of COPD as an assessment tool.<sup>a</sup>.

Quality indicators	Number of GPs <sup>b</sup> <i>n</i> = 58
Patients with acute bronchitis:	
Proportion treated with antibiotics	35 (60)
Patients with pneumonia:	
Proportion treated with narrow-spectrum penicillin	51 (88)
Proportion treated with broad-spectrum penicillin ± clavulanic acid	36 (62)
Proportion treated with macrolides	32 (55)
Proportion treated with quinolones	25 (43)
Proportion treated with cephalosporins	24 (41)
Patients with acute lower respiratory tract infections:	
Proportion treated with narrow-spectrum penicillin	50 (86)
Proportion treated with antibiotics	36 (62)
Proportion treated with broad-spectrum penicillin ± clavulanic acid	33 (57)
Proportion with a CRP test < 20 mg/l treated with antibiotics	31 (53)
Proportion treated with macrolides	29 (50)
Proportion treated with quinolones	25 (43)
Proportion treated with cephalosporins	25 (43)
Patients with acute respiratory tract infections:	
Proportion with no history of penicillin allergy treated with macrolides	31 (53)
Proportion treated with antibiotics	27 (47)
Patients with acute exacerbation of COPD:	
Proportion treated with antibiotics	48 (83)
Proportion treated with broad-spectrum penicillin ± clavulanic acid	47 (81)
Proportion not fulfilling all the Anthonisen criteria <sup>c</sup> treated with antibiotics	34 (59)
Proportion treated with macrolides	30 (52)
Proportion treated with quinolones	26 (45)

COPD, chronic obstructive pulmonary disease; CRP test, C-reactive protein rapid test.

<sup>a</sup>GPs who rated the quality indicator ≥ 3 on a four-point Likert scale.

<sup>b</sup>Data presented as *n* (%).

<sup>c</sup>Increased dyspnoea, increasing expectorate and increasing purulence of expectorate.

'Proportion of patients with AOM and discharging ear treated with antibiotics' was a good assessment tool.

#### *Comparing attitudes towards quality indicators with actual practice*

33 Danish GPs agreed on more than 50% of the quality indicators, and 25 GPs believed that ≤ 50% of the quality indicators were suitable for assessing the quality of their daily work with patients with RTIs. There were no significant differences in practice characteristics of the two groups of GPs (Table 3). The GPs who agreed on most quality indicators registered 1269 patients with RTIs, of which 35.4% were treated with antibiotics, while GPs who disagreed on ≥ 50% of the quality indicators registered 903 patients, among whom 36.3% were treated with antibiotics (data not shown). Although nearly the same proportion of patients were treated with antibiotics, the distribution of the type of antibiotic prescribed differed significantly between the two groups ( $P < 0.001$ , chi-squared test) (Table 4). 74.4% (95% CI: 70.1–78.4) of prescriptions for RTIs comprised of narrow-spectrum penicillin and 10.7% (95% CI: 7.8–13.7) of macrolides in

the group of GPs who agreed on most quality indicators, while narrow-spectrum penicillin accounted for 60.4% (95% CI: 54.8–65.7) and macrolides for 21.3% (95% CI: 17.0–26.2) of the prescriptions by GPs who disagreed on most quality indicators.

## DISCUSSION

### *Main findings*

None of the quality indicators was assessed by all 58 GPs to be suitable as a good assessment tool for evaluating the quality of antibiotic treatment of patients with RTIs. However, all quality indicators focusing on the frequency of prescribing of narrow-spectrum penicillin were rated suitable by most Danish GPs. On the contrary, the majority of GPs found that the quality indicators focusing on the frequency of prescribing of cephalosporins or quinolones were unusable in daily practice.

Some 33 Danish GPs indicated that more than 50% of the quality indicators were suitable for assessing the quality of their daily work with patients with RTIs, while 25 GPs agreed on ≤ 50% of the 41 quality indicators. GPs

Table 3. Characteristics of the two groups of GPs in relation to their assessment of quality indicators for treatment of respiratory tract infections.

	GPs who agreed with > 50% of the quality indicators <i>n</i> = 33	GPs who agreed with ≤ 50% of the quality indicators <i>n</i> = 25
Females <sup>a</sup>	48.5 (30.8–66.5)	36.0 (18.0–57.5)
Age in years <sup>b</sup>	52.1 (49.2–55.0)	54.2 (50.8–57.6)
GPs working in a single-handed practice <sup>a</sup>	42.4 (24.6–60.2)	40.0 (19.4–60.6)
Years working in a general practice <sup>b</sup>	14.1 (10.4–17.8)	17.1 (13.3–20.9)
Working days per week <sup>b</sup>	4.5 (4.3–4.8)	4.5 (4.3–4.8)
Working hours in the consultation per day <sup>b</sup>	8.2 (7.8–8.5)	8.2 (8.0–8.4)
Consultations per day <sup>b</sup>	25.1 (23.4–26.8)	25.7 (23.8–27.6)
Minutes per consultation <sup>b</sup>	12.7 (11.8–13.5)	12.3 (11.3–13.3)
Home visits per week <sup>b</sup>	2.7 (2.1–3.3)	3.4 (2.4–4.3)

Note: Two-sample tests of proportion for percentages and two-sample *t*-tests for means demonstrated no statistically significant differences of any of the characteristics between the two groups of GPs.

<sup>a</sup>Data presented as percentages (95% CI).

<sup>b</sup>Data presented as mean (95% CI).

in the two groups, approximately treated the same percentages of patients with antibiotics, but distribution of type of antibiotic prescribed differed significantly. The GPs who disagreed on the majority of the quality indicators prescribed more macrolides and less narrow-spectrum penicillin than GPs who agreed on the main part of the quality indicators.

#### Strengths and limitations

To our knowledge, this is the first study to clarify an association between the assessments of antibiotic prescribing for RTIs in a theoretical framework with the prescribing pattern in the daily clinical practice. Anyhow, this study has several possible limitations.

First, the core question, i.e., 'this quality indicator is suitable for assessing the quality of my daily work,' might be regarded as a loaded statement and consequently agreement or disagreement, respectively, with the quality indicators is probably not unambiguous. Moreover, although we provided each GP with basic information about the objective and interpretation of a

quality indicator we are not able to explore whether the GPs had the same conception of the quality indicators.

Furthermore, the representativeness of the participating Danish GPs can be discussed. 102 Danish GPs accepted to participate in the HAPPY AUDIT project and some 58 GPs assessed the set of quality indicators for antibiotic treatment of RTIs. The characteristics of GPs in this study were very much like the characteristics of the total population of GPs in Denmark in 2008 (22). However, GPs participated on a voluntary basis and their assessments of the quality indicators, as well as their prescribing habits may not necessarily be representative of the average Danish GP (23). GPs accepting to participate may have been more interested in quality development than GPs in general, and possibly the GPs had a greater interest in the topic being investigated than other GPs (24). In conclusion, the group of participating GPs was probably not representative of the average Danish GPs. It is, however, reasonable to state that the quality indicators were assessed in a Danish setting.

We recognize that the GPs might have forgotten to record some patients since consultations are often

Table 4. The distribution of antibiotics prescribed for respiratory tract infections by the two groups of GPs.<sup>a</sup>

	Number of patients treated with antibiotics by GPs who agreed on > 50% of the quality indicators ( <i>n</i> = 449)	Number of patients treated with antibiotics by GPs who agreed on ≤ 50% of the quality indicators ( <i>n</i> = 328)
Narrow-spectrum penicillin	74.4 (70.1–78.4)	60.4 (54.8–65.7)
Broad-spectrum penicillin ± clavulanic acid	10.5 (7.8–13.7)	15.2 (11.5–19.6)
Macrolides	10.7 (8.0–13.9)	21.3 (17.0–26.2)
Others <sup>b</sup>	4.5 (2.7–6.8)	3.0 (1.5–5.5)

Chi<sup>2</sup>-test (comparison of the distribution of antibiotics prescribed): *P* < 0.001.

<sup>a</sup>Data presented as percentages (95% CI).

<sup>b</sup>Other antibiotics than penicillins or macrolides.



complex and addressing several problems. This possible selection bias should be taken into account when interpreting the results, although the number of recorded patients with RTIs per GP, on average, was in accordance with similar studies applying the same type of registration method (25,26).

Finally, as this set of internationally developed quality indicators were tested in a Danish setting, it is possible that the assessment had looked different if they were assessed by GPs in other countries because of different national guidelines and diverse patterns of antibiotic resistance.

#### *Comparison with existing literature*

We found that even though an expert panel agreed on a set of quality indicators for antibiotic treatment of RTIs only a few of them were rated suitable as an assessment tool by the GPs, who are supposed to use them. This result is in line with a previous study by Campbell et al., who demonstrated that some quality measures developed by an expert panel were not fully accepted by GPs and nurses in 60 general practices (27). These findings emphasize the fact that it is of major importance to involve GPs in the development of quality indicators since practising GPs are 'experts in general practice'—even if they are not 'experts in antibiotics.'

Another Danish study dealing with the assessment of quality indicators for prescribing in general practice concluded that the GPs prefer quality indicators that are based on clinical data at the patient level, while the indicators focusing on the frequency of drug prescribing were not considered to have face value (28). In contrast, this study demonstrated that GPs do find some quality indicators focusing on the frequency of drug prescribing suitable, but it depends on the type of drug included. Quality indicators focusing on the frequency of prescribing of narrow-spectrum penicillin, which is the recommended choice of antibiotic treatment for most RTIs in general practice in Denmark, were rated suitable by the main part of GPs. Conversely, most GPs disliked the quality indicators focusing on the frequency of prescribing of cephalosporins and quinolones. Probably those quality indicators obtained low agreement rates because the involved drugs are seldom prescribed for RTIs in Denmark and the Danish GPs did not find them relevant for assessing the quality of their daily work.

This study demonstrated that the GPs who disagreed on most of the quality indicators prescribed less narrow-spectrum penicillin and more macrolides for RTIs, than the GPs who agreed on the majority of the proposed quality indicators. The authors are not aware of any previous study investigating this association, but a newly published Norwegian study showed

that GPs with a high practice activity are, in general, more liberal with respect to the prescription of antibiotics for RTIs, and the higher the antibiotic prescription rate, the larger the share penicillin agents that are not narrow-spectrum (29). This type of information may be used as a tool to identify practices with inappropriate use of antibiotics to target interventions and quality improvement programs on practices with the highest need.

#### *Implications for future research and clinical practice*

A major topic of concern in general practice is the quality of antibiotic prescription since increasing problems with antibiotic resistance are a reality in many countries. These internationally developed quality indicators can be applied to general practice in many countries, but as a minimum they should be assessed by a group of native-born GPs before they are implemented. The quality indicators can motivate GPs to optimize their antibiotic treatment of patients with RTIs and to identify inappropriate prescribing patterns.

More research is needed to achieve an in-depth exploration of the GPs' beliefs and concerns about this set of quality indicators and a qualitative study should be performed. Moreover, the quality indicators should be tested further in clinical practice to investigate their feasibility and reliability.

#### CONCLUSION

This study demonstrated that even though an expert panel agreed on a set of quality indicators for antibiotic treatment of RTIs, only a few of them were rated suitable by the GPs supposed to use them. This finding emphasizes the fact that it is of major importance to involve GPs in the development of quality indicators, since a successful implementation requires that GPs find the quality indicators understandable, relevant and suitable for their daily work in practice.

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