

Disease-specific antibiotic prescribing quality indicators report



ESAC

*European
Surveillance of
Antimicrobial
Consumption*

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Executive summary

In 2007, ESAC (www.esac.ua.ac.be) published a set of 12 valid drug-specific quality indicators for outpatient antibiotic use in Europe. Now, we aimed to develop a set of evidence-based disease-specific quality indicators for outpatient antibiotic prescribing in Europe.

Within the ESAC Ambulatory Care Subproject two half day meetings were convened in 2008 and 2009 to produce a list of proposed evidence-based disease-specific quality indicators for outpatient antibiotic prescribing conform recommendations of the DURQUIM, building on previous and similar development of drug-specific quality indicators, and in close collaboration with both CHAMP and HAPPY AUDIT. 62 experts from 33 countries were asked to complete 2 rounds of scoring of the proposed indicators on seven dimensions, i.e. their relevance to 1. reducing antimicrobial resistance, 2. patient health benefit, 3. cost-effectiveness, 4. policy makers, 5. individual prescribers, their evidence base, and their range of acceptable use, using a scale ranging from 1 (= completely disagree), over 5 (= uncertain) to 9 (= completely agree). According to the UCLA-RAND appropriateness method, proposed indicators were judged relevant if the median score was not within the 1-6 interval and if there was consensus, i.e. the number of scores within the 1-3 interval was less than one third of the panel.

For each of the 6 main indications for antibiotic prescribing (acute otitis media, acute upper respiratory infection, acute/chronic sinusitis, acute tonsillitis, acute bronchitis/bronchiolitis, cystitis/other urinary infection) and for pneumonia (labelled by ICPC codes. H71, R74, R75, R76, R78, U71 and R81, respectively), 3 quality indicators were proposed, i.e. *a.* the percentage of patients with age and/or gender limitation prescribed an antibiotic; *b.* the percentage patients with age and/or gender limitation prescribe an antibiotic, and receiving the recommended antibiotic; *c.* the percentage of patients with age and/or gender limitation prescribed an antibiotic, and receiving quinolones. This set of 21 disease-specific quality indicators was scored by 40 experts from 25 countries. Already after one scoring round, all indicators were rated as relevant antibiotic prescribing indicators on all seven dimensions, except 3a. [The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01)] was scored 6 on cost- effectiveness.

All 21 (7x3) proposed disease-specific quality indicators outpatient antibiotic prescribing have face validity and are potentially applicable. In line with the main objectives of antimicrobial use surveillance at the European level, this set of indicators could be used to better describe antibiotic use and assess the quality of national antibiotic prescribing patterns in ambulatory care.

Introduction

In 2007, the ESAC project published a set of 12 valid quality indicators for outpatient antibiotic use in Europe.¹ Antibiotic use is increasingly recognised as the main driver for antimicrobial resistance.²⁻⁴ And, if we want to improve antibiotic use, we have to be able to measure it. Meanwhile, in the US total antibiotic consumption is included as quality indicator by the National Committee for Quality Assurance, (NACQ; www.ncqa.org/Portals/0/HEDISQM/HEDIS2009/2009_Measures.pdf) and in Scotland the Scottish Government and the Scottish Antimicrobial Prescribing Group (SAPG) have agreed that seasonal variation of quinolone use should be $\leq 5\%$ (http://www.sehd.scot.nhs.uk/mels/CEL2009_11.pdf). Our drug-specific quality indicators however might not be as relevant for individual prescribers as they are for policy makers.

The largest volumes of antibiotic prescriptions for systemic use are prescribed in primary care,² with respiratory (RTI) and urinary tract infections (UTI) being the most common indications.⁵ In addition, the effects of antibiotic consumption and resistance can be observed at practice-level.^{3,4} ⁶ Therefore, we aimed to develop a set of evidence-based disease-specific quality indicators for outpatient antibiotic prescribing in Europe, using similar methodology as we used before to develop our drug-specific quality indicators.

Methods

Developing a set of quality indicators

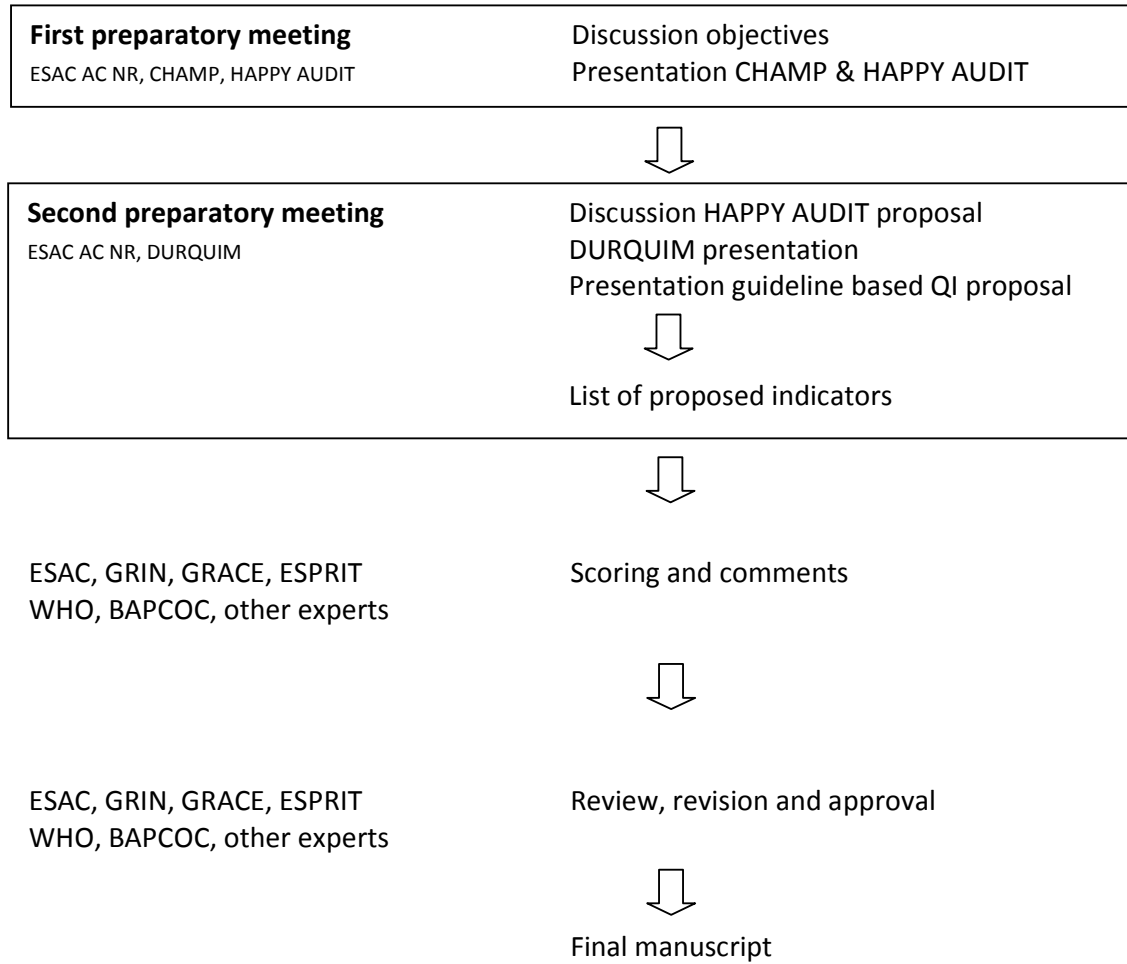
Quality indicators are defined as explicitly defined measurable items of antibiotic use giving a possible indication of the level of quality,^{7, 8} focussing on different aspects of quality (effectiveness, safety, appropriateness and costs;⁹ compliance and persistence), and relevant for clinical practice.¹⁰

To produce a proposed list of evidence-based disease-specific quality indicators for antibiotic prescribing in Europe, two meetings were convened in Antwerp by the ESAC Ambulatory Care Subproject Group, funded by the European Centre for Disease prevention and Control (ECDC) (Figure 1). During the first meeting in June 2008 (Annex 1) the ESAC drug-specific quality indicators were presented, as well as results from 2 European projects, HAPPY AUDIT (Health Alliance for Prudent Prescribing, Yield and Use of Antimicrobial Drugs in the Treatment of Respiratory Tract Infections; www.happyaudit.org)¹⁰ and CHAMP (Changing behaviour of Health care professionals And the general public towards a More Prudent use of anti-microbial agents),¹¹ with closely related objectives. HAPPY-AUDIT shared its useful experience in developing quality indicators for diagnosis and treatment of RTI in general practice using a modified Delphi methodology. And, CHAMP shared information on its collection and comparison of national guidelines for RTI (including acute lower respiratory tract infections, acute sore throat, acute otitis media and acute sinusitis).

A second meeting (Annex 2) was held one year later to present and discuss the DURQUIM framework for quality indicators,¹² the HAPPY AUDIT quality indicators for diagnosis and treatment of RTI,^{13, 14} as well as a proposed list of ESAC disease-specific quality indicator using guidelines (collected in CHAMP) as evidence base for the main antibiotic prescribing indications based on IMS Health data on antibiotic prescribing in primary care in France, Germany, Italy, Spain and the United Kingdom by indication labelled with ICPC-2-R codes (data not shown). Finally, NA and SC planned to describe a proposed list of quality indicators using the same outline as for the ESAC drug-specific quality indicators i.e. each indicator contains: indicator number: title [Label], definition, public health objective, calculation formula, acceptable use and recommended action; limitations, and references and national guidelines.

During both meetings, the presence of clinicians and scientists with expertise in general practice, microbiology, infectious diseases, pharmaco-epidemiology, pharmacy and/or drug utilisation allowed to discuss the development of quality indicators from the perspective of professionals, and to produce a proposed set of disease specific antibiotic prescribing quality indicators as well as a roadmap describing the next steps with these indicators.

Figure 1: The development of outpatient disease specific antibiotic prescribing quality indicators



Assessing a set of quality indicators

To assess the relevance of the proposed disease-specific quality indicators two consecutive cycles of scoring were performed. 62 experts with expertise in general practice, microbiology, infectious diseases, pharmaco-epidemiology, pharmacy and/or drug utilisation, from 33 countries were sent an e-mail containing the proposed set of quality indicators and a scoring sheet. They were invited to score the proposed set of disease specific antibiotic prescribing quality indicators on 7 dimensions i.e. their relevance to 1. reducing antimicrobial resistance, 2. patient health benefit, 3. cost-effectiveness, 4. policy makers, 5. individual prescribers; 6. their evidence base and 7. their range of acceptable use, using a scale ranging from 1 (= completely disagree), over 5 (= uncertain) to 9 (= completely agree). If participants did not agree with the range of acceptable use (score: 1-5), they were asked to suggest a new acceptable lower and upper limit. Experts were welcome to make any suggestion to improve the description of the proposed indicators, ideally providing supporting evidence. These were to be taken into account in the second round of scoring.

The scores were processed according to the UCLA-RAND appropriateness method.^{15, 16} Proposed indicators were judged relevant if the median score was not within the 1-6 interval and if there was consensus, i.e. if the number of scores within the 1-3 interval was less than one third of the panel.

Defining a final set of quality indicators

To define the final set only relevant indicators were selected.

Table 1 : List of proposed disease specific antibiotic prescribing quality indicators in Europe.

N°	Title	Label
1a.	The percentage of patients aged between 18 and 75 years with acute bronchitis/bronchiolitis (ICPC-2-R: R78) prescribed antibacterials for systemic use (ATC: J01)	[R78_J01_%]
1b.	= 1a. receiving the recommended antibacterials (ATC: J01CA or J01AA)	[R78_RECOM_%]
1c.	= 1a. receiving quinolones (ATC: J01M)	[R78_J01M_%]
2a.	The percentage of patients older than 1 year with acute upper respiratory infection (ICPC-2-R: R74) prescribed antibacterials for systemic use (ATC: J01)	[R74_J01_%]
2b.	= 2a. receiving the recommended antibacterials (ATC: J01CE)	[R74_RECOM_%]
2c.	= 2a. receiving quinolones (ATC: J01M)	[R74_J01M_%]
3a.	The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01)	[U71_J01_%]
3b.	= 3a. receiving the recommended antibacterials (ATC: J01XE or J01EA or J01XX)	[U71_RECOM_%]
3c.	= 3a. receiving quinolones (ATC: J01M)	[U71_J01M_%]
4a.	The percentage of patients older than 1 year with acute tonsillitis (ICPC-2-R: R76) prescribed antibacterials for systemic use (ATC: J01)	[R76_J01_%]
4b.	= 4a. receiving the recommended antibacterials (ATC: J01CE)	[R76_RECOM_%]
4c.	= 4a. receiving quinolones (ATC: J01M)	[R76_J01M_%]
5a.	The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01)	[R75_J01_%]
5b.	= 5a. receiving the recommended antibacterials (ATC: J01CA or J01CE)	[R75_RECOM_%]
5c.	= 5a. receiving quinolones (ATC: J01M)	[R75_J01M_%]
6a.	The percentage of patients older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71) prescribed antibacterials for systemic use (ATC: J01)	[H71_J01_%]
6b.	= 6a. receiving the recommended antibacterials (ATC: J01CA or J01CE)	[H71_RECOM_%]
6c.	= 6a. receiving quinolones (ATC: J01M)	[H71_J01M_%]
7a.	The percentage of patients aged between 18 and 65 years with pneumonia (ICPC-2-R: R81) prescribed antibacterials for systemic use (ATC: J01)	[R81_J01_%]
7b.	= 7a. receiving the recommended antibacterials (ATC: J01CA or J01AA)	[R81_RECOM_%]
7c.	= 7a. receiving quinolones (ATC: J01M)	[R81_J01M_%]

Results

As a result of two ESAC Ambulatory Care Subproject Group meetings, it was concluded to develop a proposed list of quality indicators for the 6 main antibiotic prescribing indications (acute otitis media, acute upper respiratory infection, acute/chronic sinusitis, acute tonsillitis, acute bronchitis/bronchiolitis, and cystitis/other urinary infection) and for pneumonia (labelled with ICPC-2-R codes H71, R74, R75, R76, R78, U71, and R81, respectively), and not to adopt the HAPPY AUDIT quality indicators, because for example it is hard to assess their evidence-base based on their description, and to produce indicator values using data routinely collected in electronic medical health records in primary care. For each of these 7 indications 3 indicators were proposed:

- a. The percentage of patients with age and/or gender limitation prescribed an antibiotic;
- b. The percentage of patients with age and/or gender limitation prescribed an antibiotic, and receiving the guideline recommended antibiotic ;
- c. The percentage of patients with age and/or gender limitation prescribed an antibiotic, and receiving quinolones (Table 1 and Annex 3).

All 21 indicators were described in a way that allowed them to be read and scored on their own. Therefore, parts of their description are very similar.

We received the scores from 40 participants (12 women; 25 countries). 8 experts declined (6 no time, 2 no longer active in the research field), 3 experts forwarded their invitation to another expert within their network, and 14 did not respond. After the first round of scoring all indicators were rated as relevant (i.e. score not within 1-6 interval) quality indicators on all 7 dimensions except 3a i.e. the percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01), which was scored 6 for cost-effectiveness.

Table 2 Relevance of the proposed disease-specific quality indicators for outpatient antibiotic prescribing in Europe: the scores* for and consensus[†] on 7 dimensions: their relevance to reducing 1. antimicrobial resistance, 2. patient health benefit, 3. cost-effectiveness, 4. policy makers, and 5. individual prescribers; 6. their evidence base and 7. their range of acceptable use.

N°	Label	Resistance			Patient health benefit			Cost-effectiveness			Policy makers			Individual prescribers			Evidence based			Acceptable range		
		Median	N	Consensus	Median	N	Consensus	Median	N	Consensus	Median	N	Consensus	Median	N	Consensus	Median	N	Consensus	Median	N	Consensus
1a.	[R78_J01_%]	9	40	+	7	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+
1b.	[R78_RECOM_%]	8	40	+	7	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+
1c.	[R78_J01M_%]	9	40	+	7	40	+	8	40	+	8	40	+	8	40	+	7	40	+	8	40	+
2a.	[R74_J01_%]	9	40	+	8	40	+	8	40	+	8	40	+	8.5	40	+	8.5	40	+	8	40	+
2b.	[R74_RECOM_%]	8	40	+	7	40	+	7	40	+	8	40	+	8	40	+	8	40	+	8	40	+
2c.	[R74_J01M_%]	9	40	+	7	40	+	7	40	+	8	40	+	8.5	40	+	7.5	40	+	8	40	+
3a.	[U71_J01_%]	7	40	+	8	40	+	6	40	+	7	40	+	7	40	+	7	40	+	8	40	+
3b.	[U71_RECOM_%]	8	40	+	8	40	+	7	40	+	8	40	+	8	40	+	8	40	+	8	40	+
3c.	[U71_J01M_%]	9	40	+	7	40	+	8	40	+	8	40	+	8.5	40	+	7.5	40	+	8	40	+
4a.	[R76_J01_%]	8.5	40	+	7.5	40	+	8	40	+	8	40	+	8	40	+	8	40	+	7.5	40	+
4b.	[R76_RECOM_%]	8.5	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+
4c.	[R76_J01M_%]	9	40	+	8	40	+	8	40	+	8	40	+	8	40	+	7.5	40	+	7.5	40	+
5a.	[R75_J01_%]	8	40	+	7	40	+	8	40	+	8	40	+	8	40	+	8	40	+	7.5	40	+
5b.	[R75_RECOM_%]	8	40	+	7	40	+	7	40	+	8	40	+	8	40	+	7	40	+	8	40	+
5c.	[R75_J01M_%]	8.5	40	+	7.5	40	+	8	40	+	8	40	+	8	40	+	7	40	+	8	40	+
6a.	[H71_J01_%]	9	40	+	7	40	+	7.5	40	+	8	40	+	8	40	+	8	40	+	8	40	+
6b.	[H71_RECOM_%]	8	40	+	8	40	+	7	40	+	8	40	+	8.5	40	+	8	40	+	8	40	+
6c.	[H71_J01M_%]	8.5	40	+	7	40	+	7	40	+	8	40	+	9	40	+	7	40	+	7	40	+
7a.	[R81_J01_%]	7	40	+	9	40	+	7	40	+	8	40	+	8	40	+	9	40	+	8.5	40	+
7b.	[R81_RECOM_%]	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+
7c.	[R81_J01M_%]	8	40	+	8	40	+	8	40	+	8	40	+	8	40	+	7	40	+	8	40	+

* A scale ranging from 1 (= completely disagree), over 5 (= uncertain) to 9 (= completely agree) was used.

† Proposed indicators were judged relevant and potentially valid if the median score for relevance was not within the 1-6 interval and if there was consensus, i.e. if the number of scores within the 1-3 interval was less than one third of the panel.

Discussion

Taking into account the scores from a relevant group of experts – professionals rather than policy makers – from a set of 21 (7x3) proposed guideline based disease-specific quality indicators for outpatient antibiotic use in Europe, all seem to be relevant, i.e. have face validity and are potentially applicable. Only one proposed indicator, the percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01), was not scored as relevant for one out of 7 dimensions, i.e. for cost-effectiveness. The fact that not all countries recommend antibacterials in the treatment of urinary tract infection could be a possible explanation.

These results are remarkable since they were achieved already after the first of two rounds of scoring. And what is more, the expert panel consisted of experts from 24 different countries all over Europe and Israel (Figure 2). Because all quality indicators are well-defined the risk of misinterpretation is limited. In addition, for all indicators an evidence base was provided based on current national guidelines and this was scored as relevant.

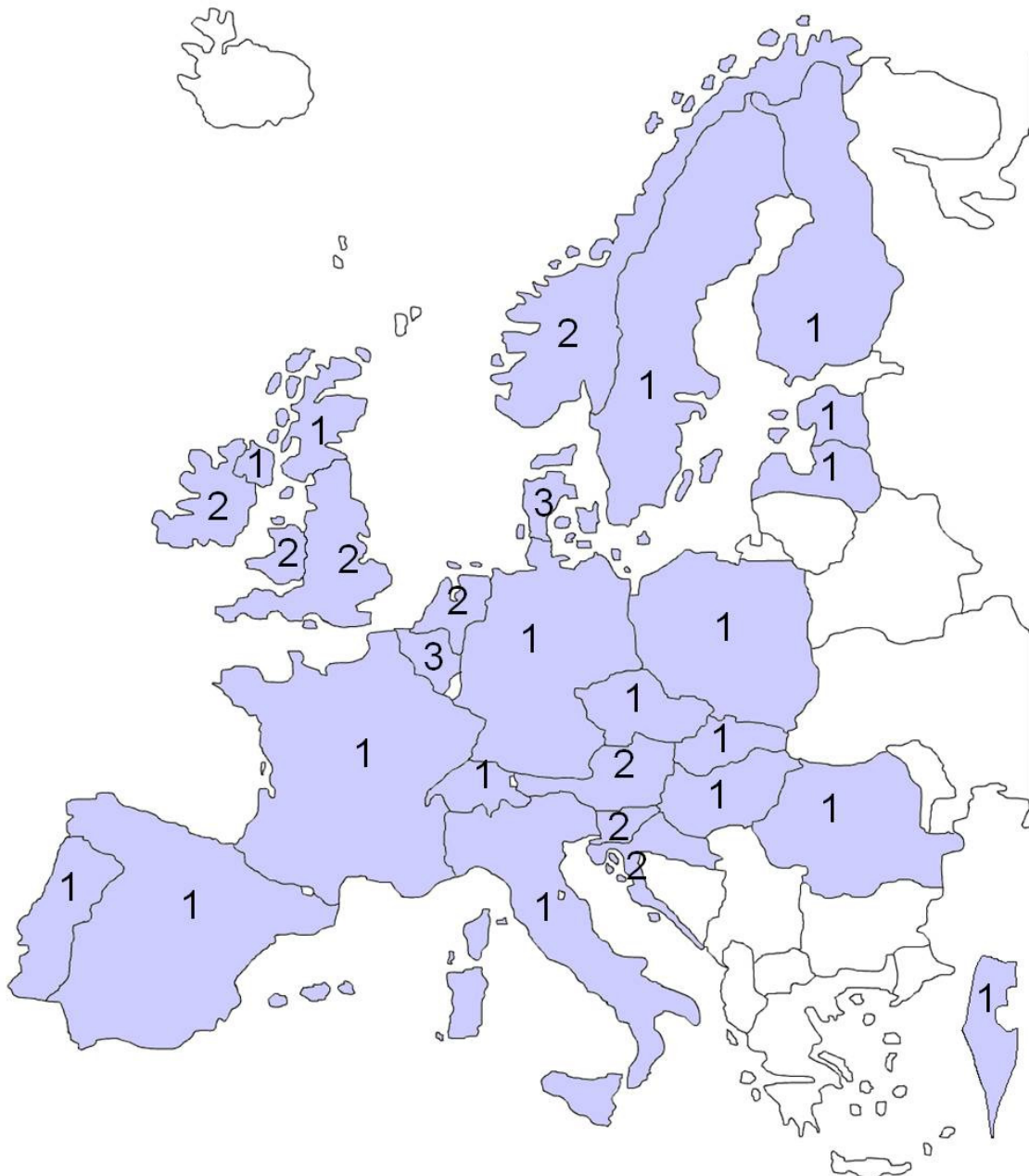
Some limitations have to be taken into account. When interpreting the indicators expressing the percentage of patients prescribed an antibiotic (i.e. Table 1, 1a - 7a), different thresholds for consulting a GP because of differences in health care organisation in primary care settings¹⁷ can influence the acceptable range. Delayed prescribing is another potential bias in the interpretation of values for these quality indicators. The percentage of patients prescribed the recommended antibiotics (i.e. Table 1, 1b - 7b) can be biased by country specific guidelines recommending other antibiotic classes as first line therapy, e.g. small spectrum penicillins for acute otitis media (H71) in Scandinavian countries.^{18, 19} The percentage of patients prescribed quinolones (i.e. Table 1, 1c - 7c), also been suggested as quality indicator by Altiner et al.,²⁰ can be biased by specific resistance patterns.

Unlike the ESAC drug-specific quality indicators for which values can be derived from ESAC data, for these disease-specific quality indicators data linking antibiotic prescriptions with patients age/gender and diagnosis are not readily available.

Although, a Dutch study in which clinical information from individual patients was linked to antibiotic use, and guidelines were used as a quality benchmark,²¹ assessed the quality of antibiotic prescribing related to indication, and this was even done on a national scale in the Netherlands,²² and Finland (ref English MIKSTRA rapport to be added), in many European countries this is not feasible at present.

Our quality indicators are linked to disease using the revised second edition of International Classification of Primary Care (ICPC-2-R) codes. Well aware that in daily general practice the link between a diagnostic label or code and the actual disease might not always be reliable, we believe that linking to an international classification is the most pragmatic solution. Since publication by WONCA in 1987,²³ ICPC has received increasing world recognition as an appropriate and comprehensive classification for general/family practice and primary care, and has been used extensively in some parts of the world, notably in Europe and Australia. The World Health Organization (WHO) has accepted ICPC as a WHO related classification to be used for health information registration in primary care. Additionally, ICPC-2 has been mapped to the 10th revision of the WHO International Classification of Diseases (ICD-10).²⁴

Figure 2 Map of Europe (+Israel): the number in each country represents the number of experts participating in the expert panel



In the ESAC Ambulatory Care Subproject, we aim to collect routinely collected general practitioners' antibiotic prescribing data linked to indication expressed in ICPC-2-R or ICD-10 to substantially broaden our interpretation of the striking variation in antibiotic use between European countries, and to produce values for the final set of 21 evidence-based disease-specific quality indicators. But, the collection of these data has been challenging. Other projects have shown such routinely collected data exist in most European countries, e.g. Electronic Health Indicator Data (eHID).²⁵ But, these data are not easily accessible or have not been processed. The publication of these quality indicators will hopefully result in increased accessibility of these routinely collected data sources.

Once this hurdle is overcome, our quality indicators will be very easy to implement, even at the level of the individual primary care prescriber using electronic medical records with ICPC coding for diagnosis, and ATC coding for antibiotic prescriptions. This in contrast to other primary care quality indicators that require information like CRP values or Anthonisen criteria as in the HAPPY AUDIT quality indicators.¹⁴

Comparisons between peers has been considered an important stimulus to quality improvement. e.g. to antibiotic consumption as well.²⁶ If our proposal is considered acceptable by general practitioners, our final set of quality indicators could allow GPs, practices, networks or even individual countries to assess their position in relation to others. This could trigger actions to improve antimicrobial prescribing. It could also allow identifying temporal trends and regional differences and therefore trigger investigation and action. Finally, this set of indicators will be available to inform the process of development, implementation and evaluation of national and regional guidelines, and thus be useful for policy makers as well.

Although the acceptable range was scored relevant the use of this range as a real benchmark has to be avoided. In our opinion one benchmark value on a European level cannot be given, but rather a range of acceptable indicator values should be defined.²⁷ Several contextual factors, such as local guidelines, and different threshold for consulting a GP because of differences in health care organisation in primary care settings¹⁷ have to be taken into account, and might justify adaptations to the range of acceptable use.

After all, some of the variations revealed by routine data may reflect real and important variations in actual health care quality, i.e. inappropriate antibiotic use, that merit further investigation and action, but some apparent variation may also arise because of other misleading factors such as unadjusted case mix differences.²⁸

In conclusion, our work could be considered as a solid, next step in the development of a set of valid evidence-based disease-specific quality indicators for antibiotic prescribing in Europe. Consequently, the challenge is to further validate these indicators for individual prescribers. But, up till then, even without correction for resistance patterns and other contextual factors the reported final set of ESAC disease-specific quality indicators can be used to describe antibiotic use in ambulatory care in order to assess the quality of antibiotic prescribing.

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Competing interests

None to declare.

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ANNEX 1: FIRST IN-DEPTH AMBULATORY CARE DATA COLLECTION MEETING

Participants

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Total	30	

ANNEX 2: SECOND IN-DEPTH AMBULATORY CARE DATA COLLECTION MEETING

ESAC In-depth Ambulatory Care & Economic Data Collection Kick Off Meeting

Monday 22 June 2009, Antwerp

Programme

In-depth Ambulatory Care Data Collection

Chaired by Samuel Coenen & Philippe Beutels

- | | |
|-------|---|
| 09h00 | Welcome (Herman Goossens) |
| 09h10 | Objectives and deliverables (Samuel Coenen) |
| 09h20 | Presentation of participants (All) |
| 09h40 | ESAC drug specific antibiotic prescribing quality indicators (Robert Vander Stichele) |
| 10h10 | ESAC ambulatory care data collection protocols (Samuel Coenen) |
| 10h30 | ESAC databases and limitations (Arno Muller) |
| 10h50 | <i>Coffee</i> |
| | ESAC disease specific antibiotic prescribing quality indicators |
| 11h10 | HAPPY AUDIT Proposal (Samuel Coenen) |
| 11h30 | CHAMP guideline review based proposal (Niels Adriaenssens) |
| 11h50 | Discussion (All) |
| 12h50 | Conclusion (Samuel Coenen) |
| 13h00 | <i>Lunch</i> |



In-depth Economics Data Collection

Chaired by Samuel Coenen & Philippe Beutels

- | | |
|-------|--|
| 14h00 | Objectives and deliverables (Philippe Beutels) |
| 14h10 | Overview and discussion of determinants list (Philippe Beutels) |
| 14h30 | Specific additional questions : responses, reasons for non-response (Philippe Beutels) |
| 15h00 | Analytical methods and preliminary results (José Cortinas) |
| 16h00 | Discussion |
| 16h15 | <i>Coffee</i> |
| 16h35 | Timelines and plans for further analyses (Philippe Beutels & José Cortinas) |
| 17h00 | AOM |
| 17u30 | <i>End of the meeting</i> |

Participants

Name	Country
Jiri Vlcek	Czech Republic
Herman Goossens	Belgium
José Cortinas	Belgium
Tomas Tesar	Slovakia
Vlasta Deckovic	Croatia
Iva Butic	Croatia
Erik Hendrickx	Belgium
Bob Vanderstichele	Belgium
Rudi Stroobants	Belgium
Peter Davey	UK
Hayley Wickens	UK
Gerlinde Oegger	Austria
Mafalda Ribeirinho	Portugal
Paul van der Linden	The Netherlands
Theo Verheij	The Netherlands
Hege Salvesen Blix	Norway
Sigvard Mölstad	Sweden
Yuliya Stoyanova	Bulgaria
Ulrica DohnHammar	Sweden
Philippe Cavalie	France
Ulrich Stab Jensen	Denmark
Marcel Bruch	Luxembourg
Gabriel-Adrian Popescu	Romania
Arno Muller	France
Vanessa Vankerckhoven	Belgium
Niels Adriaenssens	Belgium
Philippe Beutels	Belgium
Samuel Coenen	Belgium

ANNEX 3: PROPOSED SET OF DISEASE-SPECIFIC ANTIBIOTIC PRESCRIBING QUALITY INDICATORS

General format of the proposed set of disease-specific indicators

For each of seven major indications for antibiotic prescribing in general practice three related indicators are proposed. One on the decision whether or not to prescribe antibiotics, and two on the kind of antibiotic prescribed. All proposed indicators are described in a way that allows them to be read and scored on their own. Nevertheless no single indicator can provide a complete picture of the quality of general practitioners antibiotic prescribing. The final set will be based on the result of your scoring. Any suggestions to optimise the calculation/construction of the indicators and/or its description are welcome.

Indicator number: Title [Label]

All proposed indicators are numbered, given an informative title and a label. The number and the label allow you to link this document with the scoring sheet. After selection and approval of the final set of indicators the number and label will allow linking this set with a table showing indicator values.

Definition

Provides a basic description of the indicator.

Public health objective

Describes the justification for the selection of the particular indicator, i.e. its relevance to reducing antimicrobial resistance, to patients' health benefit, to cost-effectiveness, to policymakers and to individual prescribers. These attributes can be affected both by the volume and the choice of the prescribed antibiotics. We based our indicators on European guidelines if available. If not, we based them on consensus among national guidelines.

Calculation formula:

Describes how the indicator value is calculated.

For a better description of antibiotic prescribing, we suggest to use another measure than DID [DDD (Defined Daily Dose) per 1000 inhabitants per day], i.e. the number of patients being prescribed an antibiotic. We adopted the Anatomical Therapeutic Chemical (ATC) –classification to label the antibiotics and the International Classification of Primary Care (ICPC-2-R) to label the indications. All indicators are expressed as a percentage.

Acceptable use and recommended action

Aims to provide a framework for the decision on acceptable use, the interpretation of the indicator value and the recommended action, based on (inter)national guidelines. We take the position that in general one benchmark value on a European level cannot be given, but rather a range of acceptable indicator values should be defined. For any action planned explicit targets should be set.

Limitations

Enumerates specific limitations of the indicator, which should be taken into account when interpreting its value.

References and national guidelines

Provides the references and national guidelines consulted to develop the indicators.

List of proposed disease-specific antibiotic prescribing quality indicators

N°	Title	Label
1a.	The percentage of patients aged between 18 and 75 years with acute bronchitis/bronchiolitis (ICPC-2-R: R78) prescribed antibacterials for systemic use (ATC: J01)	[R78_J01_%]
1b.	= 1a. receiving the recommended antibacterials (ATC: J01CA or J01AA)	[R78_RECOM_%]
1c.	= 1a. receiving quinolones (ATC: J01M)	[R78_J01M_%]
2a.	The percentage of patients older than 1 year with acute upper respiratory infection (ICPC-2-R: R74) prescribed antibacterials for systemic use (ATC: J01)	[R74_J01_%]
2b.	= 2a. receiving the recommended antibacterials (ATC: J01CE)	[R74_RECOM_%]
2c.	= 2a. receiving quinolones (ATC: J01M)	[R74_J01M_%]
3a.	The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01)	[U71_J01_%]
3b.	= 3a. receiving the recommended antibacterials (ATC: J01XE or J01EA or J01XX)	[U71_RECOM_%]
3c.	= 3a. receiving quinolones (ATC: J01M)	[U71_J01M_%]
4a.	The percentage of patients older than 1 year with acute tonsillitis (ICPC-2-R: R76) prescribed antibacterials for systemic use (ATC: J01)	[R76_J01_%]
4b.	= 4a. receiving the recommended antibacterials (ATC: J01CE)	[R76_RECOM_%]
4c.	= 4a. receiving quinolones (ATC: J01M)	[R76_J01M_%]
5a.	The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01)	[R75_J01_%]
5b.	= 5a. receiving the recommended antibacterials (ATC: J01CA or J01CE)	[R75_RECOM_%]
5c.	= 5a. receiving quinolones (ATC: J01M)	[R75_J01M_%]
6a.	The percentage of patients older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71) prescribed antibacterials for systemic use (ATC: J01)	[H71_J01_%]
6b.	= 6a. receiving the recommended antibacterials (ATC: J01CA or J01CE)	[H71_RECOM_%]
6c.	= 6a. receiving quinolones (ATC: J01M)	[H71_J01M_%]
7a.	The percentage of patients aged between 18 and 65 years with pneumonia (ICPC-2-R: R81) prescribed antibacterials for systemic use (ATC: J01)	[R81_J01_%]
7b.	= 7a. receiving the recommended antibacterials (ATC: J01CA or J01AA)	[R81_RECOM_%]
7c.	= 7a. receiving quinolones (ATC: J01M)	[R81_J01M_%]

For a list with corresponding ICD-10 codes, see Addendum 1 (page 28)

Indicator 1a: The percentage of patients aged between 18 and 75 years with acute bronchitis/bronchiolitis (ICPC-2-R: R78) prescribed antibacterials for systemic use (ATC: J01) [R78_J01_%]

Definition

The percentage of patients **aged between 18 and 75 years** with **acute bronchitis/bronchiolitis (ICPC-2-R: R78)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for acute bronchitis/bronchiolitis.

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The largest volume of antibiotics prescribed in ambulatory care is for acute bronchitis/bronchiolitis. Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for patients with suspected or definite pneumonia; selected exacerbations of COPD; those aged over 75 years with fever; cardiac failure, insulin-dependent diabetes mellitus and for serious neurological disorder (i.e. stroke).⁴ Therefore, antibiotics should be used appropriately for acute bronchitis/bronchiolitis (ICPC-2-R: R78), i.e. (no) antibiotics for those who will (not) benefit from the treatment.

Calculation formula:

Number of patients aged between 18 and 75 years diagnosed with R78 prescribed J01 x 100
----- %
Number of patients aged between 18 and 75 years diagnosed with R78

Acceptable use and recommended action

The acceptable use ranges between 0-30%, i.e. taking into account the prevalence of patients aged between 18 and 75 years with relevant co-morbidity.

If the use is higher than the upper limit of this range, more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of differences in health care organization the threshold for consulting a GP for acute bronchitis/bronchiolitis can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 1b: The percentage of patients aged between 18 and 75 years with acute bronchitis/bronchiolitis (ICPC-2-R: R78) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01CA or J01AA) [R78_RECOM_%]

Definition

The percentage of patients aged **between 18 and 75 years** with **acute bronchitis/bronchiolitis (ICPC-2-R: R78)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [penicillins with extended spectrum (ATC: J01CA) or tetracyclines (ATC: J01AA)] gives an estimate of appropriate antibiotic use for acute bronchitis/bronchiolitis.

Public health objective

The largest volume of antibiotics prescribed in ambulatory care is for acute bronchitis/bronchiolitis. Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for patients with suspected or definite pneumonia; selected exacerbations of COPD; those aged over 75 years with fever; cardiac failure, insulin-dependent diabetes mellitus and for serious neurological disorder (i.e. stroke).⁴

In case antibiotics are prescribed, penicillins with extended spectrum or tetracyclines are recommended as first line therapy for this indication in ambulatory care.⁴ The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

Number of patients aged between 18 and 75 years diagnosed with R78 prescribed J01CA or J01AA x
100

--%

Number of patients aged between 18 and 75 years diagnosed with R78 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence of patients aged between 18 and 75 years with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 1c: The percentage of patients aged between 18 and 75 years with acute bronchitis/bronchiolitis (ICPC-2-R: R78) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [R78_J01M_%]

Definition

The percentage of patients aged **between 18 and 75 years** with **acute bronchitis/bronchiolitis (ICPC-2-R: R78)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for acute bronchitis/bronchiolitis.

Public health objective

Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for patients with suspected or definite pneumonia; selected exacerbations of COPD; those aged over 75 years with fever; cardiac failure, insulin-dependent diabetes mellitus and for serious neurological disorder (i.e. stroke). In case antibiotics are prescribed, penicillins with extended spectrum or tetracyclines are recommended as first choice.⁴ Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for acute bronchitis/bronchiolitis (ICPC-2-R: R78) cases with resistance against first or second choice antibiotics.

Calculation formula:

Number of patients aged between 18 and 75 years diagnosed with R78 prescribed J01M x 100

%

Number of patients aged between 18 and 75 years diagnosed with R78 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients aged between 18 and 75 years with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 2a: The percentage of patients older than 1 year with acute upper respiratory infection (ICPC-2-R: R74) prescribed antibacterials for systemic use (ATC: J01) [R74_J01_%]

Definition

The percentage of patients **older than 1 year with acute upper respiratory infection (ICPC-2-R: R74)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for acute upper respiratory infection.

Common cold, sore throat and pharyngitis are also part of the ICPC-2-R R74 code according to the ICPC2-ICD10 Thesaurus.⁷ Tonsillitis is included in R76 (see indicators 4a-c).

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The second largest volume of antibiotics prescribed in ambulatory care is for acute upper respiratory infection. Guidelines recommend 'no antibiotic prescribing' except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. Therefore antibiotics should be used appropriately for acute upper respiratory infection (ICPC-2-R: R74), i.e. (no) antibiotics for those who will (not) benefit from the treatment.

Calculation formula:

Number of patients older than 1 year diagnosed with R74 prescribed J01 x 100
----- %
Number of patients older than 1 year diagnosed with R74

Acceptable use and recommended action

The acceptable use ranges between 0-20%, i.e. taking into account the prevalence of patients older than 1 year with high risk.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of different health care organization the threshold for consulting a GP for acute upper respiratory infection can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 2b: The percentage of patients older than 1 year with acute upper respiratory infection (ICPC-2-R: R74) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01CE) [R74_RECOM_%]

Definition

The percentage of patients **older than 1 year** with **acute upper respiratory infection (ICPC-2-R: R74)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [beta-lactamase sensitive penicillins (ATC: J01CE)] gives an estimate of appropriate antibiotic use for acute upper respiratory infection.

Common cold, sore throat and pharyngitis are also part of the ICPC-2-R R74 code according to the ICPC2-ICD10 Thesaurus.⁷ Tonsillitis is included in R76 (see indicators 4a-c.).

Public health objective

The second largest volume of antibiotics prescribed in ambulatory care is for acute upper respiratory infection. Guidelines recommend 'no antibiotic prescribing' except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. In case antibiotics are prescribed, beta-lactamase sensitive penicillins are recommended as first line therapy for this indication in ambulatory care. The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

$$\frac{\text{Number of patients older than 1 year diagnosed with R74 prescribed J01CE} \times 100}{\text{Number of patients older than 1 year diagnosed with R74 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges 80-100%, i.e. taking into account the prevalence of patients older than 1 year with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25

Indicator 2c: The percentage of patients older than 1 year with acute upper respiratory infection (ICPC-2-R: R74) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [R74_J01M_%]

Definition

The percentage of patients **older than 1 year** with **acute upper respiratory infection (ICPC-2-R: R74)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for acute upper respiratory infection. Common cold, sore throat and pharyngitis are also part of the ICPC-2-R R74 code according to the ICPC2-ICD10 Thesaurus.⁷ Tonsillitis is included in R76 (see indicators 4a-c.).

Public health objective

Guidelines recommend 'no antibiotic prescribing' except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. In case antibiotics are prescribed, beta-lactamase sensitive penicillins are recommended as first choice. Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for acute upper respiratory infection (ICPC-2-R: R74) cases with resistance against first or second choice antibiotics.

Calculation formula:

$$\frac{\text{Number of patients older than 1 year diagnosed with R74 prescribed J01M} \times 100}{\text{Number of patients older than 1 year diagnosed with R74 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients older than 1 year with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 3a: The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01) [U71_J01_%]

Definition

The percentage of **female** patients **older than 18 years** with **cystitis/other urinary infection (ICPC-2-R: U71)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for cystitis/other urinary infection.

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The third largest volume of antibiotics prescribed in ambulatory care is for cystitis/other urinary infection. Most guidelines recommend antibiotic prescribing for adult women.

Calculation formula:

Number of female patients older than 18 years diagnosed with U71 prescribed J01 x 100
----- %
Number of female U71 patients older than 18 years

Acceptable use and recommended action

The acceptable use ranges between 80-100%.

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of different health care organization the threshold for consulting a GP for cystitis/other urinary infection can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years) and gender.

References and national guidelines

See page 25.

Indicator 3b: The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01XE or J01EA or J01XX) [U71_RECOM_%]

Definition

The percentage of **female patients older than 18 years** with **cystitis/other urinary infection (ICPC-2-R: U71)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [nitrofurans derivatives (ATC: J01XE), trimethoprim and derivatives (ATC: J01EA), or other antibacterials (ATC: J01XX)] gives an estimate of appropriate antibiotic use for cystitis/other urinary infection.

Public health objective

The third largest volume of antibiotics prescribed in ambulatory care is for cystitis/other urinary infection. Most guidelines recommend antibiotic prescribing for adult women. Nitrofurans derivatives, trimethoprim and derivatives, or other antibacterials are recommended as first line therapy for this indication in ambulatory care. In case of pregnancy penicillins with extended spectrum (ATC: J01CA) are advised. The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

Number of female patients older than 18 years diagnosed with U71 prescribed J01XE or J01EA or J01XX x 100
-----%
Number of female patients older than 18 years diagnosed with U71 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence pregnancy of female patients older than 18 years.

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other or no antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years) and gender.

References and national guidelines

See page 25.

Indicator 3c: The percentage of female patients older than 18 years with cystitis/other urinary infection (ICPC-2-R: U71) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [U71_J01M_%]

Definition

The percentage of **female** patients **older than 18 years** with **cystitis/other urinary infection (ICPC-2-R: U71)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for cystitis/other urinary infection.

Public health objective

Most guidelines recommend antibiotic prescribing for adult women. In case antibiotics are prescribed, nitrofurantoin derivatives, trimethoprim and derivatives, or other antibacterials are recommended as first choice. Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for cystitis/other urinary infection (ICPC-2-R: U71) cases with resistance against first or second choice antibiotics.

Calculation formula:

$$\frac{\text{Number of female patients older than 18 years diagnosed with U71 prescribed J01M} \times 100}{\text{Number of female patients older than 18 years diagnosed with U71 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account female patients older than 18 years with known resistance against first or second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years) and gender.

References and national guidelines

See page 25.

Indicator 4a: The percentage of patients older than 1 year with acute tonsillitis (ICPC-2-R: R76) prescribed antibacterials for systemic use (ATC: J01) [R76_J01_%]

Definition

The percentage of patients **older than 1 year** with **acute tonsillitis (ICPC-2-R: R76)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for acute tonsillitis. Sore throat and pharyngitis are included in the ICPC-2-R code R74 according to the ICPC2-ICD10 Thesaurus (see indicators 2a-c.).⁷

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The fourth largest volume of antibiotics prescribed in ambulatory care is for acute tonsillitis. Guidelines recommend 'no antibiotic prescribing' except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. Therefore antibiotics should be used appropriately for acute tonsillitis (ICPC-2-R: R76), i.e. (no) antibiotics for those who will (not) benefit from the treatment.

Calculation formula:

Number of patients older than 1 year diagnosed with R76 prescribed J01 x 100

Number of patients older than 1 year diagnosed with R76

%

Acceptable use and recommended action

The acceptable use ranges between 0-20%, i.e. taking into account the prevalence of patients older than 1 year with high risk.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of different health care organization the threshold for consulting a GP for acute tonsillitis can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 4b: The percentage of patients older than 1 year with acute tonsillitis (ICPC-2-R: R76) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (J01CE) [R76_RECOM_%]

Definition

The percentage of patients **older than 1 year** with **acute tonsillitis (ICPC-2-R: R76)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [beta-lactamase sensitive penicillins (ATC: J01CE)] gives an estimate of appropriate antibiotic use for acute tonsillitis. Sore throat and pharyngitis are included in the ICPC-2-R code R74 according to the ICPC2-ICD10 Thesaurus (see indicators 2a-c.).⁷

Public health objective

The fourth largest volume of antibiotics prescribed in ambulatory care is for acute tonsillitis. Guidelines recommend 'no antibiotic prescribing' except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. In case antibiotics are prescribed, beta-lactamase sensitive penicillins are recommended as first line therapy for this indication in ambulatory care. The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

$$\frac{\text{Number of patients older than 1 year diagnosed with R76 prescribed J01CE} \times 100}{\text{Number of patients older than 1 year diagnosed with R76 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence of patients older than 1 year with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 4c: The percentage of patients older than 1 year with acute tonsillitis (ICPC-2-R: R76) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [R76_J01M_%]

Definition

The percentage of patients **older than 1 year** with **acute tonsillitis (ICPC-2-R: R76)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for acute tonsillitis. Sore throat and pharyngitis are included in the ICPC-2-R code R74 according to the ICPC2-ICD10 Thesaurus (see indicators 2a-c.).⁷

Public health objective

Guidelines recommend ‘no antibiotic prescribing’ except for patients younger than 6 months (rounded to 1 year for practical reasons) and other high risk patients. In case antibiotics are prescribed, beta-lactamase sensitive penicillins are recommended as first choice. Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for acute tonsillitis (ICPC-2-R: R76) cases with resistance against first or second choice antibiotics.

Calculation formula:

$$\frac{\text{Number of patients older than 1 year diagnosed with R76 prescribed J01M} \times 100}{\text{Number of patients older than 1 year diagnosed with R76 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients older than 1 year with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs’ antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients’ age (in years).

References and national guidelines

See page 25.

Indicator 5a: The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01) [R75_J01_%]

Definition

The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for acute/chronic sinusitis.

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The fifth largest volume of antibiotics prescribed in ambulatory care is for acute/chronic sinusitis. Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for severe cases (i.e. symptoms persisting or increasing after 5 days and fever >38°C).⁸ Therefore antibiotics should be used appropriately for acute/chronic sinusitis (ICPC-2-R: R75), i.e. (no) antibiotics for those who will (not) benefit from the treatment.

Calculation formula:

$$\frac{\text{Number of patients older than 18 years diagnosed with R75 prescribed J01} \times 100}{\text{Number of patients older than 18 years diagnosed with R75}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-20%, i.e. taking into account the prevalence of patients older than 18 years with symptoms persisting or increasing after 5 days and fever >38°C.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of different health care organization the threshold for consulting a GP for acute/chronic sinusitis can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 5b: The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01CA or J01CE) [R75_RECOM_%]

Definition

The percentage of patients **older than 18 years** with **acute/chronic sinusitis (ICPC-2-R: R75)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [penicillins with extended spectrum (ATC; J01CA) or beta-lactamase sensitive penicillins (ATC: J01CE)] gives an estimate of appropriate antibiotic use for acute/chronic sinusitis.

Public health objective

The fifth largest volume of antibiotics prescribed in ambulatory care is for acute/chronic sinusitis. Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for severe cases (i.e. symptoms persisting or increasing after 5 days and fever >38°C).⁸ In case antibiotics are prescribed, penicillins with extended spectrum or beta-lactamase sensitive penicillins are recommended as first line therapy for this indication in ambulatory care. The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

Number of patients older than 18 years diagnosed with R75 prescribed J01CA or J01CE x 100
----- %
Number of patients older than 18 years diagnosed with R75 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence of patients older than 18 years with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 5c: The percentage of patients older than 18 years with acute/chronic sinusitis (ICPC-2-R: R75) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [R75_J01M_%]

Definition

The percentage of patients **older than 18 years** with **acute/chronic sinusitis (ICPC-2-R: R75)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for acute/chronic sinusitis.

Public health objective

Guidelines recommend 'no antibiotic prescribing' for adults (>18 years) except for severe cases (i.e. symptoms persisting or increasing after 5 days and fever >38°C).⁸ In case antibiotics are prescribed, penicillins with extended spectrum or beta-lactamase sensitive penicillins are recommended as first line therapy for this indication in ambulatory care. Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for acute/chronic sinusitis (ICPC-2-R: R75) cases with resistance against first or second choice antibiotics.

Calculation formula:

$$\frac{\text{Number of patients older than 18 years diagnosed with R75 prescribed J01M} \times 100}{\text{Number of patients older than 18 years diagnosed with R75 prescribed J01}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients older than 18 years with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 6a: The percentage of patients older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71) prescribed antibacterials for systemic use (ATC: J01) [H71_J01_%]

Definition

The percentage of patients **older than 2 years** with **acute otitis media/myringitis (ICPC-2-R: H71)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for acute otitis media/myringitis.

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

The sixth largest volume of antibiotics prescribed in ambulatory care is for acute otitis media/myringitis. Guidelines recommend 'no antibiotic prescribing' except for some children younger than 2 and patients with poor general condition. Therefore antibiotics should be used appropriately for acute otitis media/myringitis (ICPC-2-R: H71), i.e. (no) antibiotics for those who will (not) benefit from the treatment.

Calculation formula:

$$\frac{\text{Number of patients older than 2 years diagnosed with H71 prescribed J01} \times 100}{\text{Number of patients older than 2 years diagnosed with H71}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 0-20%, i.e. taking into account the prevalence of patients older than 2 years with poor general condition.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

Because of different health care organization the threshold for consulting a GP for acute otitis media/myringitis can be different in different primary care settings.⁵

This quality indicator can be biased by delayed prescribing.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 6b: The percentage of patients older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01CA or J01CE) [H71_RECOM_%]

Definition

The percentage of patients **older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [penicillins with extended spectrum (ATC: J01CA) or beta-lactamase sensitive penicillins (ATC: J01CE)] gives an estimate of appropriate antibiotic use for acute otitis media/myringitis.

Public health objective

The sixth largest volume of antibiotics prescribed in ambulatory care is for acute otitis media/myringitis. Guidelines recommend 'no antibiotic prescribing' except for some children younger than 2 and patients with poor general condition. In case antibiotics are prescribed, penicillins with extended spectrum or beta-lactamase sensitive penicillins are recommended as first line therapy for this indication in ambulatory care. The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

Number of patients older than 2 years diagnosed with H71 prescribed J01CA or J01CE x 100
----- %
Number of patients older than 2 years diagnosed with H71 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence of patients older than 2 years with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 6c: The percentage of patients older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [H71_J01M_%]

Definition

The percentage of patients **older than 2 years with acute otitis media/myringitis (ICPC-2-R: H71)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for otitis media/myringitis.

Public health objective

Guidelines recommend 'no antibiotic prescribing' except for some children younger than 2 and patients with poor general condition. In case antibiotics are prescribed, penicillins with extended spectrum or beta-lactamase sensitive penicillins are recommended as first choice. Only in case of known resistance against first or second choice antibiotics quinolones can be used. Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for acute otitis media/myringitis (ICPC-2-R: H71) cases with resistance against first or second choice antibiotics.

Calculation formula:

Number of patients older than 2 years diagnosed with H71 prescribed J01M x 100
----- %
Number of patients older than 2 years diagnosed with H71 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients older than 2 years with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 7a: The percentage of patients aged between 18 and 65 years with pneumonia (ICPC-2-R: R81) prescribed antibacterials for systemic use (ATC: J01) [R81_J01_%]

Definition

The percentage of patients aged **between 18 and 65 years** with **pneumonia (ICPC-2-R: R81)** prescribed antibacterials for systemic use (ATC: J01) gives an estimate of GPs antibiotic prescribing behaviour for pneumonia.

Public health objective

Antibiotic use is increasingly recognized as the major selective pressure driving antimicrobial resistance.^{1,2} In addition, antibiotic use requires more resources, motivates patients to reconsult and exposes them to the additional risk of side effects, whereas underprescribing might be associated with higher risk of complications of untreated infections.³

Guidelines recommend antibiotic prescribing for adults (>18 years) but for patients older than 65 years ambulatory treatment is being questioned.^{4,9}

Calculation formula:

$$\frac{\text{Number of patients aged between 18 and 65 years diagnosed with R81 prescribed J01} \times 100}{\text{Number of patients aged between 18 and 65 years diagnosed with R81}} \quad \%$$

Acceptable use and recommended action

The acceptable use ranges between 90-100%.

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

The diagnosis of pneumonia is not necessarily confirmed by X-ray. Therefore This quality indicator can be biased by clinical interpretation of symptoms.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

Indicator 7b: The percentage of patients aged between 18 and 65 years with pneumonia (ICPC-2-R: R81) prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials (ATC: J01CA or J01AA) [R81_RECOM_%]

Definition

The percentage of patients aged **between 18 and 65 years** with **pneumonia (ICPC-2-R: R81)** prescribed antibacterials for systemic use (ATC: J01) receiving the recommended antibacterials [penicillins with extended spectrum (ATC: J01CA) or tetracyclines (ATC: J01AA)] gives an estimate of appropriate antibiotic use for pneumonia.

Public health objective

Guidelines recommend antibiotic prescribing for adults (>18 years) but for patients older than 65 years ambulatory treatment is being questioned.^{4,9} In case antibiotics are prescribed, penicillins with extended spectrum or tetracyclines are recommended as first line therapy for this indication in ambulatory care.⁴ The recommended antibacterials were selected taking into account their effectiveness against relevant pathogens, clinical benefit and cost. Their use can limit the use of other antibiotic classes, either not effective or to be reserved for resistant cases. Unnecessary use of any antibiotic will also select for resistance.

Calculation formula:

Number of patients aged between 18 and 65 years diagnosed with R81 prescribed J01CA or J01AA x 100

--%

Number of patients aged between 18 and 65 years diagnosed with R81 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 80-100%, i.e. taking into account the prevalence of patients aged between 18 and 65 years with IgE mediated allergy to penicillins.⁶

If the use is lower than the lower limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by country specific guidelines recommending other antibiotics as first line therapy.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25

Indicator 7c: The percentage of patients aged between 18 and 65 years with pneumonia (ICPC-2-R: R81) prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) [R81_J01M_%]

Definition

The percentage of patients aged **between 18 and 65 years** with **pneumonia (ICPC-2-R: R81)** prescribed antibacterials for systemic use (ATC: J01) receiving quinolones (ATC: J01M) gives an estimate of inappropriate antibiotic use for pneumonia.

Public health objective

Guidelines recommend antibiotic prescribing for adults (>18 years) but for patients older than 65 years ambulatory treatment is being questioned.^{4,9} In case antibiotics are prescribed, penicillins with extended spectrum or tetracyclines are recommended as first choice.⁴ In case of IgE mediated allergy to penicillins quinolones can be used.

Currently, resistance against quinolones is low but quinolone use is associated with development of resistance as well. Therefore quinolones have to be reserved for pneumonia (ICPC-2-R: R81) cases with resistance against first or second choice antibiotics.

Calculation formula:

Number of patients aged between 18 and 65 years diagnosed with R81 prescribed J01M x 100
----- %
Number of patients aged between 18 and 65 years diagnosed with R81 prescribed J01

Acceptable use and recommended action

The acceptable use ranges between 0-5%, i.e. taking into account the prevalence of patients aged between 18 and 65 years with IgE mediated allergy to penicillins,⁶ and patients with known resistance against first and second choice antibiotics.

If the use is higher than the upper limit of this range, a more detailed assessment is recommended in order to define the action required. For any action planned explicit targets should be set.

Limitations

This quality indicator can be biased by specific resistance patterns.

Values for this indicator can only be produced based on data linking GPs' antibiotic prescribing with the indication (ICPC-2-R or ICD-10 label) and the patients' age (in years).

References and national guidelines

See page 25.

References and national guidelines

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UK – Scotland. SIGN. Community management of lower respiratory tract infections in adults. 2002

The Netherlands. NHG. Acute Cough. 2003

Belgium. BAPCOC. Acute lower respiratory tract infections in adults. 2006

France. AFSSAPS. Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003

Germany Universitatsspital Basel. Akute Bronchitis. 2004

Norway. Acute Bronchitis. 2008

Denmark. Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005

National guidelines consulted for acute upper respiratory infection (ICPC-2-R: R74)

- UK – England.** Clinical Knowledge Summaries. Acute sore throat. 2007
- UK – Scotland.** SIGN. Management of sore throat and indications for tonsillectomy. 2002
- The Netherlands** NHG. Acute Sore Throat. 1999
- Belgium** BAPCOC. Acute Sore Throat. 2006
- Belgium** BAPCOC Common cold. 2006
- France** AFSSAPS Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003
- Germany** Universitatsspital Basel. Principles of diagnosis and treatment of infections of the upper airways. 2004
- Norway** Streptococcus A Throat Infection and Scarlet Fever. 2008
- Sweden** STRAMA Swedish guidelines for the treatment of rhinosinusitis, pharyngotonsillitis and acute media otitis in children. 2000
- Denmark** Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005

National guidelines consulted for cystitis/other urinary infection (ICPC-2-R: U71)

- UK - England** Clinical Knowledge Summaries Urinary tract infection (lower) – women
- UK - Scotland** SIGN Management of suspected bacterial urinary tract infection in adults. 2006
- Netherlands** NHG Urinary tract infections 2005
- Belgium** BAPCOC Acute cystitis 2006

National guidelines consulted for acute tonsillitis (ICPC-2-R: R76)

- UK – England.** Clinical Knowledge Summaries. Acute sore throat. 2007
- UK – Scotland.** SIGN. Management of sore throat and indications for tonsillectomy. 2002
- The Netherlands** NHG. Acute Sore Throat. 1999
- Belgium** BAPCOC. Acute Sore Throat. 2006
- France** AFSSAPS Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003
- Germany** Universitatsspital Basel. Principles of diagnosis and treatment of infections of the upper airways. 2004
- Norway** Streptococcus A Throat Infection and Scarlet Fever. 2008
- Sweden** STRAMA Swedish guidelines for the treatment of rhinosinusitis, pharyngotonsillitis and acute media otitis in children. 2000
- Denmark** Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005

National guidelines consulted for acute/chronic sinusitis (ICPC-2-R: R75)

UK - England Clinical Knowledge Summaries Acute sinusitis 2002
The Netherlands NHG Rhinosinusitis 2005
Belgium BAPCOC Acute rhinosinusitis 2006
France AFSSAPS Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003
Germany Universitatsspital Basel. Principles of diagnosis and treatment of infections of the upper airways. 2004
Norway Sinusitic 2008
Sweden STRAMA Swedish guidelines for the treatment of rhinosinusitis, pharyngotonsillitis and acute media otitis in children. 2000
Denmark Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005
Finland Finnish Society of Otorhinolaryngology Acute sinusitis: Finnish clinical practice guidelines. 2005

National guidelines consulted for acute otitis media/myringitis (ICPC-2-R: H71)

UK - England Clinical Knowledge Summaries Otitis Media – acute. 2005 (revised 2007)
UK – Scotland. Scottish Intercollegiate Guideline Network. Diagnosis and management of childhood otitis media in primary care. 2003
The Netherlands NHG Acute Otitis Media in children. 2006
Belgium BAPCOC Acute Otitis Media. 2001
France AFSSAPS Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003 (updated 2005)
Germany Universitatsspital Basel. Acute Otitis Media. 2004
Norway Acute Otitis Media 2008
Sweden STRAMA Swedish guidelines for the treatment of rhinosinusitis, pharyngotonsillitis and acute media otitis in children. 2000
Denmark Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005

National guidelines consulted for pneumonia (ICPC-2-R: R81)

UK – England. Clinical Knowledge Summaries Chest infections – adult. 2005
UK – Scotland. SIGN. Community management of lower respiratory tract infections in adults. 2002
The Netherlands. NHG. Acute Cough. 2003
Belgium. BAPCOC. Acute lower respiratory tract infections in adults. 2006
France. AFSSAPS. Systemic antibiotic treatment in upper and lower respiratory tract infections: official French guidelines. 2003
Denmark. Institute for Rational Pharmacotherapy and Audit Project Odense. Respiratory infections: Manual for the diagnosis and treatment in general practice. 2005

Addendum 1: List of corresponding ICD-10 codes

ICPC-2-R	ICD-10
H71	H66.4, H66.9, H67.0, H67.1, H67.8, H70.0, H73.0
R74	B00.2, B08.5, J00, J02.8, J02.9, J06.0, J06.8, J06.9
R75	J01.0-J01.9, J32.0-J32.9
R76	J03.8, J03.9, J36
R78	J20.0-J20.9; J21.0, J21.8, J21.9, J22, J40
R81	A48.1, J10.0, J11.0, J12.0-J12.9, J13, J14, J15.0-J15.9, J16.0, J16.8, J17.0-J17.8, J18.0-J18.9
U71	N30.0-N30.9, N39.0