ADHERENCE TO EVIDENCE-BASED MEDICINE RECOMMENDATIONS IN TREATMENT OF CHILDREN HOSPITALISED WITH ACUTE BRONCHITIS—A PILOT STUDY
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ABSTRACT

BACKGROUND
Respiratory tract infections are the leading cause of hospitalisation in children and acute bronchitis is one of the most common respiratory infections in children. This study was aimed to provide a pilot tested method on how to investigate the adherence to selected evidence-based recommendations in hospitalised patients with acute bronchitis.

MATERIALS AND METHODS
The sample consisted of 80 patients with acute bronchitis. The type of the treatment was assessed according to the adherence to evidence-based recommendations.

Settings and Design- This pilot study was performed at the Children’s Clinic of Teaching Hospital in Trnava, Slovak Republic and was focused on retrospective patients’ health outcomes research.

Statistical analysis used- The type of treatment was analysed in relation to the patients’ health outcomes (length of hospitalisation) using multivariate logistic regression.

RESULTS
The situation in our sample was adequate as the adherence to the main recommendation (treatment by β2 sympathomimetics) was in 80% patients. Patients who had ATB administration during the hospitalisation (p <0.05) had increased chance of longer duration of hospitalisation (≥ 4 days) compared to the patients who had β2 sympathomimetics administration. Initial antibiotic (ATB) treatment was administered in 5% patients, 6% of all admitted patients had continued ATB treatment indicated by general practitioner.

CONCLUSION
The design of this pilot study enabled to find out the level of adherence to selected evidence-based recommendations. We recommend use of the methods verified in this study for continuous monitoring of adherence to evidence-based recommendations in health care facilities.

KEYWORDS
Respiratory Disease, Respiratory Medicine, Cough, Clinical Epidemiology.

methods of treatment contribute to the increase in costs and disparate health outcomes. The appropriate use of antibiotics leads to improvement of health care and patient safety, and may lead to cost savings.

Worldwide, even though acute bronchitis is one of the most frequent respiratory tract diseases, a limited number of studies investigating its treatment strategies have been performed. Thus, the aim of our pilot study was to provide the pilot tested method on how to investigate the adherence to selected evidence-based recommendations in hospitalised patients with acute bronchitis.

**MATERIALS AND METHODS**

The sample consisted of 80 patients with acute bronchitis hospitalised at the Children’s Clinic of Teaching Hospital in Trnava in 2010.

Our study was a pilot study focused on the retrospective research of patients’ health outcomes. We analysed the adherence to the selected Slovak recommendations provided in Table 1. These recommendations are published in principles of rational antibiotic treatment of respiratory infections available on the official website of the Slovak Society of General Practice Medicine.

The type of the treatment was analysed in relationship to the patient's health outcomes using the multivariate logistic regression in the statistic program R. The principal health outcome was the length of hospitalisation, which was divided into two categories according to the median length of hospitalisation. The first category consisted of the patients with the shorter length of hospitalisation (lower than the median) and the second category of the patients with the longer length of the hospitalisation (higher or equal to the median).

We analysed the influence of the treatment (independent variable) on the mentioned length of the hospitalisation (dependent variable).

The type of treatment was categorised as follows:
- β2 sympathomimetics administered (reference category when this is recommended treatment).
- β2 sympathomimetics with the corticoids administered (category 1).
- Antibiotics administered (category 2).

The model of multivariate logistic regression was adjusted for the age of patients as a confounder, as this is related to the administered treatment as well as to the patients’ health outcomes. The model of multivariate logistic regression was also used for prediction of the longer length of hospitalisation. The values of prediction were calculated by the statistic program R. This model was verified using the value AUC (Area under the Curve) with the range 0.5 – 1 (when AUC = 0.5 - the model has zero discriminative ability, AUC = 1 - the model has high discriminative ability). The second attribute of this validity was value of Nagelkerke’s $R^2$ with the range 0-1 (the more close to 1, the more validated is the model).

**Inclusion Criteria**

Patients with acute bronchitis hospitalised at the Children’s Clinic of Teaching Hospital in Trnava in 2010.

**Exclusion Criteria**

Patients who had signed the "discharge against medical advice".

**Ethics**

For the implementation of our research we obtained the consent of the Ethical Committee of Trnava University in Trnava in September 2013, registration number VR-14044-2013.

**RESULTS**

The sample of 80 patients with acute bronchitis consisted of 61% of boys and 39% of girls. Mean age was $24.7 \pm 26.3$ months ($2.1 \pm 2.2$ years) and minimum age was 1.5 months and maximum was 11 years.

Mean length of the hospitalisation was $4.1 \pm 3.9$ days and median was 4 days (I.Q = 3; III.Q = 5).

Based on the nationally recognised treatment recommendations in Table 1, in the first step we focused on type of initial treatment that was administered to patients after hospital admission, Figure 1. The most frequent type was symptomatic treatment by β2 sympathomimetics (80%). Antibiotics (ATB) were administered in 5% patients, 6% of all patients had continued ATB treatment initiated by the general practitioner.

<table>
<thead>
<tr>
<th>Antibiotics (ATB) are not indicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Target ATB therapy of the bacterial superinfection only after the clinical and laboratory evidence.</td>
</tr>
<tr>
<td>- The symptomatic therapy is recommended (antitussives, expectorants, inhaled beta-2 sympathomimetics, anticholinergics).</td>
</tr>
</tbody>
</table>

**Table 1. Main Recommendations in Treatment of Acute Bronchitis in Children**

- Target ATB therapy of the bacterial superinfection only after the clinical and laboratory evidence.
- The symptomatic therapy is recommended (antitussives, expectorants, inhaled beta-2 sympathomimetics, anticholinergics).

The initial treatment was changed during hospitalisation if required by change of health status. In 11% of patients (n=7) who were initially on β2 sympathomimetics, the antibiotics were administered due to the symptoms presented in Figure 2.

### Table 2. Proportions of Patients with Acute Bronchitis According to The Treatment Categories in Patients

<table>
<thead>
<tr>
<th>Type of treatment</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 0 (β2 sympathomimetic)</td>
<td>46</td>
<td>60</td>
</tr>
<tr>
<td>Category 1 (β2 sympathomimetic + corticoids)</td>
<td>16</td>
<td>21</td>
</tr>
<tr>
<td>Category 2 (antibiotics)</td>
<td>15</td>
<td>19</td>
</tr>
</tbody>
</table>

The frequency of the type of treatment during the hospitalisation by the given categories is shown in Table 2. We excluded three patients who had signed the "discharge against medical advice" from the analysis to prevent the confusion in the length of the whole hospitalisation. Analysis of associations between type of treatment and the length of hospitalisation is in Table 3. The chance of longer length of hospitalisation (≥4 days) increased in patients in category 2 who had ATB administration during the hospitalisation (p<0.05) compared with the patients in reference category 0 (β2 sympathomimetics administration).

### Table 3. Model of Multivariate Logistic Regression of the Influence of Treatment on the Length of the Hospitalisation in Patients with Acute Bronchitis

<table>
<thead>
<tr>
<th>Variables</th>
<th>β</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>Type of Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 0 (ref.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 1</td>
<td>1.21</td>
<td>3.36</td>
<td>0.81</td>
<td>13.96</td>
</tr>
<tr>
<td>Category 2</td>
<td>2.06</td>
<td>7.83</td>
<td>2.09</td>
<td>29.29</td>
</tr>
<tr>
<td>Age</td>
<td>-0.02</td>
<td>0.98</td>
<td>0.95</td>
<td>1.01</td>
</tr>
</tbody>
</table>
The model of multivariate logistic analysis was used for prediction of the longer length of hospitalisation (≥ 4 days) according to the type of treatment during the hospitalisation and the age of patients. The results of the prediction are in Figure 3. The probability of longer duration of hospitalisation (≥ 4 days) reduced with increasing age in patients in all categories (β2 sympathomimetics administration, β2 sympathomimetics administration with corticoids, ATB administration). The validity of this model was verified and according to the values of AUC = 0.76 and R² = 0.22 has mild discriminative ability.

DISCUSSION
Presented study investigated adherence to selected evidence-based recommendations in patients with acute bronchitis hospitalised at the Children’s Clinic of Teaching Hospital in Trnava in 2010. Evidence based medicine may improve the health status of the population, if it is used by the majority of health care providers. Despite many years of international effort this is not easy to achieve. However, constant changes are necessary because research in medicine constantly brings new discoveries and improvements in diagnosis and treatment.

Acute bronchitis and asthma exacerbation are more often diagnosed in boys than in girls and boys are more often hospitalised. The gender difference is not present in adults. A similar pattern was observed in our sample, as more boys (61%) than girls (39%) were hospitalised for acute bronchitis.

In terms of treatment of acute bronchitis, the recommendations state that antibiotics are not indicated and should not be administered routinely. The administration of symptomatic treatment is recommended. The adherence to these main evidence-based recommendations was adequate in our sample as the symptomatic treatment by β2 sympathomimetics (in 80% patients) was the most frequent treatment initiated after hospital admission. Antibiotic treatment initiated after hospital admission was observed in 5% patients, 6% of all patients had continued antibiotic therapy started by general practitioner.

Although the routine administration of antibiotics is not recommended, their administration should be considered in specific situations when bacterial infection is suspected. If cough persists for four days, and the patient has clinical signs detected by auscultation or by chest X-ray, it is necessary to consider the presence of bacterial infection. Adherence to these recommendations is observed also in our sample when antibiotics during hospitalisation were administered only in 11% of patients who had initially administered symptomatic treatment and had persistent bronchitic status, persistent febrile illness or positive result of cultivation.

The type of administered treatment was analysed in relation to the patients’ health outcomes (length of hospitalisation). In patients who were on antibiotics, the chance of the longer duration of hospitalisation (≥ 4 days) increased significantly compared to those who had β2 sympathomimetics administration. This phenomenon can be explained by the assessment of severity of the patients’ status by medical staff and intensive medical treatment was provided to difficult cases which required longer hospitalisation.

There is a need to note the limitations of this study. One of them is a small size of the sample influencing the range of confidence intervals in the analysis of patient’s health outcomes by the multiple logistic regression model. Data were collected from the patient’s records and some of the data recorded by healthcare personnel might be missing.

CONCLUSION
Our study was a pilot study designed to determine the adherence to the selected evidence-based recommendations in the treatment of the most common respiratory disease (acute bronchitis) in patients hospitalised at Children’s Clinic of Teaching Hospital in Trnava in 2010. We recommend use of the methods verified in this study for continuous
monitoring of adherence to evidence-based recommendations in healthcare facilities.

ACKNOWLEDGEMENTS
We are very grateful to Stanislav Krizan MD, Ph.D, the head of Children’s Clinic, Teaching Hospital in Trnava, who enabled us to implement the research and provided valuable consultations.

We also would like to acknowledge the expert advice of associate professor, Martin Brezina, MD, Ph.D from Clinic of Child Pneumology and Phthisiology, University Teaching Hospital, Bratislava.

The authors would also like to acknowledge the help of Mark Taylor, Ph.D, for English-language editing of the original manuscript.

REFERENCES