

The structural analysis of medicine range for children receiving palliative care

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ABSTRACT

The paper deals with the problem of palliative medicines for children. According to the World Health Organization (WHO), the number of children up to 19 years of age who need pediatric palliative care may be as high as 21 million each year. Every year, over 180 thousand children need pediatric palliative care in Russia. The object of the research was a variety of medicines used by St. Petersburg Children's Hospice. Data processing was carried out by methods of content analysis, aggregation of data, and comparative analysis. It was found that antiepileptics N03 (10%), antibacterials for systemic use J01 (7%), and analgesics N02 (7%) dominate in a range of palliative medicines for children. Content analysis of drug prescribing information showed that 25 percent of medicines used in the hospice are unlicensed for usage in the pediatric population. It was identified that 92 percent of palliative medicines do not have pediatric dosage forms. It was shown that 39 percent of medicines are not included in the List of Vital and Essential Drugs. The paper shows perspective for the future research evidence base in pediatric palliative care that will result in an increase in the number of available medicines with appropriate formulations to provide symptom management for children with life-limiting illnesses.

Keywords: End-of-life care, Hospice care, Medicines for children, Pediatric medicines, Pediatric palliative care

Introduction

According to the World Health Organization (WHO), the number of children up to 19 years of age who need pediatric palliative care may be as high as 21 million each year [1-3]. Although there has been a trend in recent years towards declining infant and child mortality, the number of children with life-limiting illnesses has been increasing [4-6]. Every year over 180 thousand children need pediatric palliative care in Russia. There is a wide range of life-limiting and life-threatening conditions affecting children and young people, meanwhile, nearly 93 percent of all patients suffer from non-cancer diseases (congenital malformations, deformations & chromosomal abnormalities (42%), diseases of the circulatory system (23%), and newborns affected by maternal conditions that may be

unrelated to present pregnancy (7%) [7]. Children with cancer have amounted to 7 percent of the total number of patients receiving pediatric palliative care [8-10].

One of the essential conditions for enhancing the life quality of children suffering from life-limiting illnesses is the improvement of the pediatric palliative care system, a key element of which is the timely and qualitative provision of medicines. The problem of palliative medicines for children remains unresolved, even though the Russian health-care system is developing [11-14].

The purpose of this study is to carry out a structural analysis of medicine range for children receiving palliative care that will result in the suggestion of ways for improvement in medicines provision for pediatric palliative care.

Materials and Methods

The object of the present research was a variety of medicines used by St. Petersburg Children's Hospice. Pediatric palliative care facility, with a total of 23 beds, provides in-patient treatment for children with life-limiting illnesses and comprehensive out-patient services.

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The data of medicine range used by St. Petersburg Children's Hospice 2019-20 were collected. The data were transcribed in an MS Excel spreadsheet. Data processing was carried out by methods of content analysis, aggregation of data, and comparative analysis.

Results and Discussion

The data obtained demonstrated the range of medicine used by St. Petersburg Children's Hospice, which includes 171 items represented by domestic (67%) and imported (33%) medicines. The primary importers of drugs are France (6%), Germany (5%), and Poland (4%) (**Figure 1**).

It was found that generic medicines cover more than 50 percent of the medicine range used by the Children's Hospice. The values of the update index of 36 items have negative numbers, owing to the low economic profitability of the pharmaceutical market segment (**Table 1**).

Table 1. Update Index of Individual Palliative Medicines for Children, 2015 - 2020

№	International Nonproprietary Name	Update Index
1.	Algeldrate + Magnesium Hydroxide	-0,07692
2.	Aminophyllin	-0,25
3.	Amitriptyline	-0,45455
4.	Aciclovir	-0,02083
5.	Bendazol	-0,11111
6.	Bromdigidrochlorphenil Benzodiazepin	-0,07143
7.	Valproic Acid	-0,03333
8.	Vitamin E + Retinol	-0,16667
9.	Deproteinized Calves Blood Gemoderivat	-0,18182
10.	Diazepam	-0,625
11.	Diclofenac	-0,09565
12.	Diphenhydramine	-0,3
13.	Ferric (III) Hydroxide Sucrose Complex	-0,0625
14.	Inosine	-0,13333
15.	Interferon Alfa-2 Human Recombinant	-0,16667
16.	Calcium Gluconate	-0,1
17.	Calcium Chloride	-0,5

18.	Magnesium Sulfate	-0,07692
19.	Meropenem	-0,2
20.	Naphazoline	-0,12
21.	Omeprazole	-0,13462
22.	Ondansetron	-0,52632
23.	Prednisolone	-0,125
24.	Procaine	-0,12
25.	Promethazine	-2
26.	Thioridazine	-0,2
27.	Tobramycin	-0,2
28.	Topiramate	-0,3125
29.	Famotidine	-0,4
30.	Furosemide	-0,36364
31.	Chlorpromazine	-0,125
32.	Cetirizine	-0,21622
33.	Ceftazidime	-0,5
34.	Ceftriaxone	-0,44118
35.	Ciprofloxacin	-0,45455
36.	Cytochrome C	-1

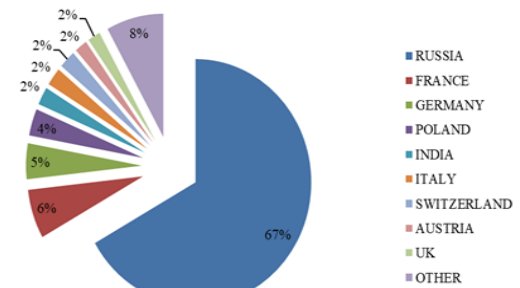


Figure 1. Segmentation of Medicines Used in the Children's Hospice by the Producer Country

It was identified that antiepileptics N03 (10%), antibacterials for systemic use J01 (7%), and analgesics N02 (7%) dominate in the range of palliative medicines for children, because of life-limiting conditions variety affecting the children receiving palliative care (**Figure 2**).

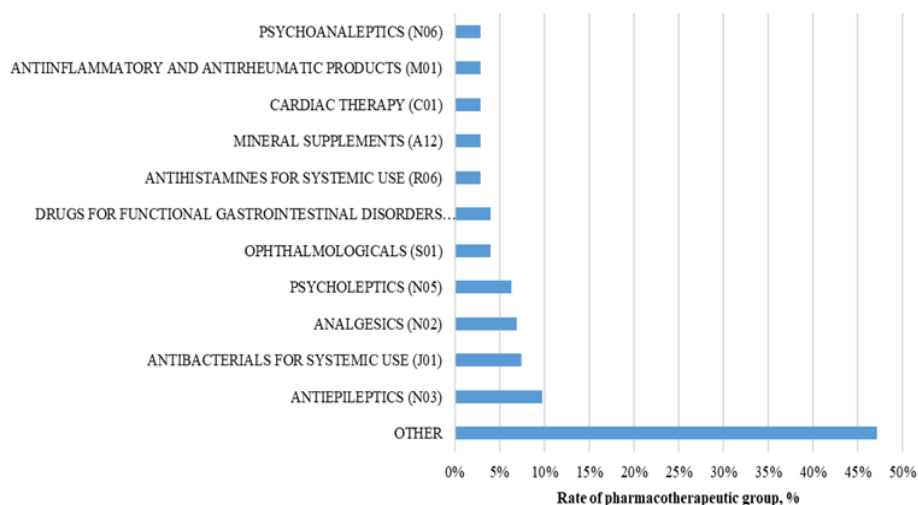


Figure 2. Segmentation of Medicines Used in the Children's Hospice by Pharmacotherapeutic Group

Segmentation of medicines used in the hospice by drug dosage form showed that items are mostly represented by tablets (28%), solutions for injection (23%), oral capsules (8%), syrups (5%), oral solutions (4%), and powder for solution for injection (3%). It was identified that age-adapted clinically relevant dosage forms with taste-masking of aversive orally administered substances cover less than 8 percent of the range of medicine used by the Children's Hospice. The current level of pediatrics development requires using safe effective non-traumatic and easy-to-administer medicines with special drug dosage forms for children [7, 15-19].

Many children with life-limiting conditions receive medication via enteral feeding tubes. The latter, in turn, makes it difficult to use oral drug products and underscores the need for the development of new delivery systems for drugs, for example through intranasal, oral transmucosal (buccal/sublingual), and transdermal routes [5, 20-23]. However, at present only one medicine (Fentanyl) is available as a transdermal delivery system. Drugs with intranasal, oral transmucosal routes are not represented in the range of medicine used by the Children's Hospice.

Content analysis of drug prescribing information showed that 25 percent of medicines used in hospice are unlicensed for use in children or need to be prescribed outside the terms of the product license. The use of off-label or unlicensed medicines in children caused by the severity and complexity of the pathology and the lack of alternative medications are approved for pediatric practice (Table 2) [6, 24-26].

It was shown that 39 percent of medicines are not included in the List of Vital and Essential Drugs. Under article 80 of the Federal Law of the Russian Federation No 323-FZ "On the fundamentals of health protection of citizens in the Russian Federation", preferential medicine provision is limited to the List of Vital and Essential Drugs [27].

Table 2. List of Used Off-label Palliative Medicines

№	International Nonproprietary Name	Drug Dosage Form	Age Limit
1.	Ciprofloxacin	Tablets	18
2.	Epinephrine	Solutions for Injection	18
3.	Vitamin E + Retinol	Oral Capsules	18
4.	Amitriptyline	Tablets	18
5.	Ammonia	Solutions for Inhalation	18
6.	Potassium and Magnesium Asparaginate	Tablets	18
7.	Benzazole	Solutions for Injection	18
8.	Diclofenac	Solutions for Injection	18
9.	Calcium Gluconate	Solutions for Injection	18
10.	Captopril	Tablets	18
11.	Famotidine	Lyophilisate for Solution for Injection	18
12.	Benfotiamine + Pyridoxine + Cyanocobalamin	Tablets	18
13.	Magnesium Sulfate	Solutions for Injection	18
14.	Ethylmethylhydroxypyridine succinate	Tablets	18
15.	Meldonium	Oral Capsules	18
16.	Milgamma	Solutions for Injection	18
17.	Naphazoline	Nasal Spray	18
18.	Ipidacrine	Tablets	18

19.	Drotaverin	Solutions for Injection	18
20.	Drotaverin	Tablets	18
21.	Osteogenon	Tablets	18
22.	Potassium Asparaginate + Magnesium Asparaginate	Concentrate for Solution for Injection	18
23.	Inosine	Tablets	18
24.	Inosine	Solutions for Injection	18
25.	Omeprazole	Oral Capsules	18
26.	Bromodihydrochlorophenylbenzodiazepine	Tablets	18
27.	Chlorhexidine	Solution for Local and External Use	18
28.	Choline Alfoscerate	Oral Capsules	18
29.	Trihexyphenidil	Tablets	18
30.	Cytochrome-C	Solutions for Injection	18
31.	Diazepam	Tablets	18
32.	Morphine	Tablets	18
33.	Morphine	Tablets	18
34.	Fentanyl	Transdermal Therapeutic System	18
35.	Ketoprofen	Solutions for Injection	15
36.	Algeldrate + Magnesium Hydroxide	Oral Suspension	15
37.	Troxerutin	Gel for External Use	15
38.	Diphenhydramine	Solutions for Injection	14
39.	Milk Thistle Fruit Extract	Dragee	12
40.	Procaine	Solutions for Injection	12
41.	Sea Buckthorn Oil	Oral Solutions	12
42.	Motherwort Herb Tincture	Tincture	12
43.	Phospholipids	Oral Capsules	12

Conclusion

1. Content analysis of drug prescribing information showed that 25 percent of medicines used in hospice are unlicensed for use in children, it highlights the systematization appropriateness of practical experience with using off-labels or unlicensed medicines in children.
2. It was identified that 92 percent of palliative medicines do not have pediatric dosage forms. The latter, in turn, shows perspective for the future research evidence base in pediatric palliative care that will result in an increase in the number of available medicines with appropriate formulations to provide symptom management for children with life-limiting illnesses.
3. It was shown that 39 percent of medicines are not included in the List of Vital and Essential Drugs. Consequently, the development and implementation of the formulary for pediatric palliative care facilities can justify the feasibility to finance through the state budget to purchase palliative medicines for children.

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