

Adherence to treatment in intensive care units on the example of pediatric sepsis: a review

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Abstract

INTRODUCTION: Intensive care does not always require only a large amount of resources. An important aspect is the formation of a multidisciplinary team involved in the treatment of patients in critical condition. **OBJECTIVE:** To demonstrate the need for the staff of intensive care units to use protocols for the diagnosis and treatment of critical conditions on the example of sepsis in children. **MATERIALS AND METHODS:** The analysis of publications devoted to the study of the impact of the implementation of the clinical recommendations of the Surviving Sepsis Campaign for the treatment of sepsis in children on the outcomes of the disease. The articles were searched in the abstract databases PubMed, Embase, Cochrane Central Register of Controlled Trials, Web of Science Core Collection and Google Scholar for the period from 2011 to July 2022. Keywords were used: "pediatric sepsis", "implementation", "protocolized treatment", "adherence". **RESULTS:** During the search, only thirteen observational studies were found, nine of which were presented retrospectively, which can be attributed to the design flaws of the submitted works. It was revealed that the use of the entire complex of diagnostic and therapeutic measures presented in clinical recommendations and protocols for intensive therapy of sepsis in children can significantly improve the results of treatment, but the commitment of doctors to their use in routine clinical practice remains low and does not exceed 40 %. **CONCLUSIONS:** The main reason for the lack of commitment to the implementation of recommendations and standards for the treatment of sepsis in children is not only in the presence of organizational obstacles, but also in the absence of reasonable algorithms for its implementation.

Приверженность к лечению в отделениях интенсивной терапии на примере сепсиса у детей: обзор литературы

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Реферат

АКТУАЛЬНОСТЬ: Для проведения интенсивной терапии не всегда требуется только большое количество ресурсов. Важным аспектом является формирование мультидисциплинарной команды, участвующей в лечении пациентов, находящихся в критическом состоянии. **ЦЕЛЬ ИССЛЕДОВАНИЯ:** Демонстрация необходимости использования персоналом отделений интенсивной терапии протоколов диагностики и лечения критических состояний на примере сепсиса у детей. **МАТЕРИАЛЫ И МЕТОДЫ:** Проведен анализ публикаций, посвященных изучению влияния выполнения клинических рекомендаций Surviving Sepsis Campaign по лечению сепсиса у детей на исходы заболевания. Поиск статей осуществлялся в реферативных базах данных PubMed, Embase, Cochrane Central Register of Controlled Trials, Web of Science Core Collection и Google Scholar за период с 2011 г. по июль 2022 г. Использовались ключевые слова: «pediatric sepsis», «implementation», «protocolized treatment», «adherence». **РЕЗУЛЬТАТЫ:** В процессе поиска найдено всего 13 наблюдательных исследований, 9 из которых были представлены ретроспективными, что можно отнести к недостаткам дизайна представленных работ. Выявлено, что использование всего комплекса диагностических и лечебных мероприятий, представленных в клинических рекомендациях и протоколах по интенсивной терапии сепсиса у детей, позволяет значительно улучшить результаты лечения, однако приверженность врачей к их применению в рутинной клинической практике остается низкой и не превышает 40 %. **ВЫВОДЫ:** Основная причина недостаточной приверженности к выполнению рекомендаций и стандартов по лечению сепсиса у детей — не только в наличии организационных препятствий, но и в отсутствии обоснованных алгоритмов ее имплементации.

KEYWORDS: intensive care, adherence, sepsis, children**КЛЮЧЕВЫЕ СЛОВА:** интенсивная терапия, приверженность, сепсис, дети

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Introduction

Introducing the achievements of medical science into the clinical practice is connected with some difficulties, but it opens up possibilities for optimal diagnosis and treatment. However, there is a big difference between science and daily practice, which demonstrated the need to find options to overcome it [1].

Many reasons exist, which form the basis for the incomplete implementation of clinical recommendations in the daily work of hospitals at various levels.

For example, if a patient has only one disease, then clinical guidelines are used often and effectively [2]. One example of that disease is the infantile respiratory distress syndrome (IRDS). One of the factors of non-fulfillment of clinical recommendations is the situation when the patient has a comorbidity and therefore clinical guidelines may conflict with each other. An example of this situation are patients with atrial fibrillation and intracranial hemorrhage. They need anticoagulants and mechanical ventilation, especially if the disease had complications of sepsis, nutritional deficit, Acute Renal Failure (ARF) or heart failure, which require catecholamines. Thus, clinician must use multiple clinical guidelines, which conflict with each other and create difficulties in choosing a patient's treatment. It forces the doctors to prioritize in treatment for each condition without being confident in their decision.

Thus, the anesthesiologist can make a decision based only on the present clinical situation, solving only those problems that have already occurred with the patient recent-

ly. More general conditions become secondary, yet they can still have fatal outcomes after some time [2].

Other factors exist behind the non-incorporation of clinical guidelines in clinical practice. One of the main factors is a non-trusting to the medical research, because the results of publications has a few mixed conclusions and cannot do in real medical practice [3]. For example, using the most quoted medicals articles do not reach even 25 % [4], which leads to the fact that some researchers set the main goal not to find new ways for scientific discoveries, but to recheck the results obtained [4, 5]. But apart from failures and contradictions, many achievements have been made in various fields over the past 20–30 years. These advances have greatly improved disease resolutions and quality of life for many patients. As an example, we can take such diseases as diabetes, bronchial asthma, polytrauma and many others.

Scientific achievements that are proven and irrefutable are combined into recommendations and guidelines. These recommendations can greatly help doctors in a difficult situation. The use of recommendations in these cases is associated with a better prognosis [6, 7]. That is why their introduction into clinical practice should be the main task not only for medical professionals, but more importantly for medical organizations that are directly responsible for the results of patient treatment.

Besides, we must understand that the including of medical recommendations in practice is not a mechanical process, that carries only one predictable result from some action and is not the only one correct protocol for diagnosis or treatment [8]. On the other hand, the task of any recommendations is to provide medical specialists with actual information that will help make the best decision for a partic-

ular patient, taking into account his characteristics. A similar situation has developed with the introduction of recommendations for the treatment of sepsis into clinical practice.

More than 12 years ago M.M. Levy et al. first of all show that despite wide fame of program “Surviving Sepsis Campaign”, only 18.4 % contained in it were recommendations for intensive treatment sepsis on first day and only after two years master-class and events of organization, this index had been 36.1 % [9].

As of now, sepsis means the breaking of regulatory reactions on the infection and has been one of leading causes which leads to death and disability for children in world. In last statistics the morbidity from sepsis for children has been about 1.2 million occurrences per year [10].

In the countries with a developed economy about 30 % fatal outcomes occur in previously healthy children, about one third have irreversible consequences, which have a significant negative impact on the quality of life of patients and their families. [11, 12]. One of possible reasons for high level of fatal outcomes are the difficulties with sepsis diagnosis for children in variables groups, especially in infants, however for the last decade the survival of patients in this category became better [11]. The most prevalent problem of timely diagnosis and treatment of sepsis is most common in countries with limited economical resources, which made sepsis a global priority in the world health organization [13]. To solve this current problem, the efforts of medical specialist all country of the world are required.

In last time the program «Surviving Sepsis Campaign» recommend to use diagnostic protocols and treatment of children with sepsis using tools like systematic screening to help doctors with early identification and treatment of pediatric sepsis from position «Sepsis-3» [10]. The creation of national and local protocols, taking into account the available health resources, will significantly improve awareness of health workers, quality of diagnosis and treatment sepsis from children [14–16].

The available data indicates that the use of protocols in diagnosis and treatment of sepsis significantly reduces mortality and improves outcomes of multiple organ dysfunction [17].

However, introducing protocols and adherence to treatment — it's completely different concepts, although at first glance they seem identical.

Adherence to treatment, according to the definition of the World Health Organization, is “a conscious choice of patients to follow the recommendations of medical professionals, aimed at restoring, maintaining and strengthening health, which implies responsibility for their own well-being”, and fulfillment/compliance is behavior in which the patient passively follows the doctor's instructions [18].

The problem of adherence to treatment in intensive care units is somewhat different from general therapeutic practice, where it is practically not related to the implementation of the prescribed treatment by the patient or his legal representative. The leading role here is played by the doctor's

implementation of modern clinical recommendations for resuscitation and intensive care. And not just the formal fulfillment of all points, but a conscious and reasonable choice of the necessary set of diagnostic and therapeutic measures, depending on the severity of the condition of a particular patient, the initial condition and the characteristics of the course of the pathological process [15].

In this regard, the very methodology for assessing adherence should be different. If for therapists and pediatricians these are different questionnaires for patients and doctors, then in the conditions of intensive care units, in our opinion, this most likely can be the degree of correspondence between predicted and actual mortality, determined based on the use of scales for assessing the severity of the condition. Unfortunately, neither in domestic nor in foreign literature contain substantiated proposals for assessing the degree of adherence of intensive care unit personnel to treatment using clinical protocols and standards.

It needs to be noted that it is fundamentally important not to simply fulfill individual points of the treatment protocol, but to implement the entire complex of diagnostic and therapeutic measures that are provided for in it. It is known that predictions regarding the results and outcomes of treatment cannot be effective if the assessment of adherence to treatment is not used to select the optimal therapeutic strategy, since it is this which has a much greater influence on the outcome of the disease than simply the provision of medical resources [19].

Lack of adherence to treatment is a global problem of present medicine [18]. The results of many works have revealed a number of facts and features of the problem under consideration. First, there is a great variety of terms on the topic of commitment, which indicates its ambiguity. Secondly, many factors have been identified that affect adherence to treatment, which significantly complicates the task of solving this problem. Thirdly, the “golden standard” method of diagnostics and a universal strategy for increasing adherence to treatment have not yet been found. Over the past thirty years, many researchers have noted the lack of significant progress in the study of the problem of adherence and the low effectiveness of most of the proposed methods for improving it. Thus, a number of questions on the problem of adherence to treatment are currently unresolved. This is due to the multifactorial nature of this problem: according to the World Health Organization, more than two hundred and fifty factors have been identified which, to some degree, affect patient compliance with doctor's recommendations. According to the classification of the World Health Organization, these factors are divided into five groups:

- 1) associated with patients;
- 2) associated with doctors and the organization of the healthcare system;
- 3) drug therapy factors;
- 4) disease factors, and
- 5) a group of socioeconomic factors [18].

It was found that large-scale educational events (seminars, meetings, online simulation of training) improve the quality of medical care, reduce delays in prescribing antibiotics and volume load in the treatment of septic shock in children [20]. At the same time, there is an opinion that educational activities aimed at increasing adherence to treatment are effective only in the short and medium term [18]. Recent studies at the Children's Hospital of Philadelphia have also shown that algorithmic alerts based on the analysis of a child's vital signs and severity, integrated into an electronic database, provide the best sensitivity and specificity in the treatment of sepsis (sensitivity 96.6–99.4%; specificity 83.3–99.1%) [21, 22]. This study also highlights the importance of introducing digital technologies into the daily work of the clinic in order to improve the quality of therapy.

Today, multiple significant studies are available that show a reduction in mortality and/or duration of hospital treatment with adequate implementation of modern protocols in the treatment of sepsis. E. Damiani et al. (2015) conducted a systematic review of 50 studies in adults assessing mortality in sepsis, depending on the compliance of initial therapy with SSC recommendations. They came to the conclusion, that despite the incomparability of different studies, an increase in the rate of compliance with recommendations for intensive care in the first six and twenty-four hours of treatment was accompanied by a significant decrease in mortality (OR = 0.66 [0.61–0.72]) [23]. C.W. Seymour et al. (2017) show to the need for earlier implementation of recommendations for intensive care for sepsis. They found that early antibiotic prescription had a greater impact on outcomes than timely volemic loading [24]. Thus, clinical practice in some cases also indicates a different degree of importance of recommendations with a comparable level of evidence.

The foregoing determined **the purpose of our work** — to demonstrate the need for the use of protocols for the diagnosis and treatment of critical conditions by the personnel of intensive care units using the example of sepsis for children.

Materials and methods

We analyzed international observations of development in children with sepsis in critical condition in daily clinical practice. For this we used studies evaluating the impact of the Sepsis Survival Campaign recommendations on outcomes of sepsis in children. The articles we chose were found in abstract databases PubMed, Embase, Cochrane Central Register of Controlled Trials, Web of Science Core Collection and Google Scholar for the period from 2011 to 2022 using commonly used words: “children's sepsis”, “implementation”, “treatment according to the protocol”, “compliance with the treatment regimen”. After the first

researcher selected desired article, all disagreements about pre-selection were allowed from discussions with feedback. The final list of articles is used to validate eligible studies. Criteria for inclusion in the review: 1) type of article: conducting research in all supported international journals without language or national restrictions; 2) subjects: children with sepsis; 3) study: impact on outcome. From the selected articles, the second researcher independently extracted the following data: surname, name, patronymic of the first author; name of the journal; country; year of publication; study design; number of patients (*n*); results and examinations.

Analysis of the features of the protocol for the treatment of sepsis in children

During the search, we found thirteen articles that met to requirements (Table 1). It should be noted, that all articles included are available from observational studies. Most of the articles about the high quality of sepsis treatment in children are published in large pediatric centers in the United States [25–31, 34]. There are no domestic publications on this topic yet. Undoubtedly, none of the presented studies have a sufficiently high level of evidence, however all demonstrated that the quality of care for children with sepsis and outcomes of disease are more improved in accordance with clinical practice protocols developed on the basis of the «Surviving Sepsis Campaign».

In our opinion, in the most important searches of I.V.R. Evans et al. (2018) found that the implementation of all recommendations for the treatment of sepsis within the first hour is associated with the greatest survival of children, while the implementation of only one element of the protocol does not affect the result [34].

R. Paul et al. (2012), J. Fernandez-Sarmiento et al. (2018), E. Long et al. (2021), and A.T. Cruz et al. (2011) found that after training and introduction the protocols into the clinical practice, the time from setting diagnosis to dotation infusion solves and antibiotics became the shortest [25, 27, 32, 35].

A. Ackan Arikan et al. (2015) reported a decrease in cases of acute kidney injury, and F. Balamuth et al. (2016) talked about the reduction of the frequency of appearance of organ dysfunction [29, 30]. G.Y. Larsen et al. (2011) showed time reduction of treatment in hospital [26].

These researchers showed effective treatment sepsis of children with using protocols. They also showed that in real clinical practice significant barriers exist for their introductions. This leads to significant differences in the provision of medical care both at the national, international, and regional levels [23, 24, 27].

In particular, UK researchers reported varying implementation rates ranging from 22 to 47% for elements of sepsis treatment protocols in 160 participating hospitals participating in the program «Sepsis pathway» [15]. Creation of a commission for treatment sepsis and a patient Safety

Table 1. Analysis of the results of the recorded treatment of sepsis in children

Author, magazine, publication year	Design	n	Studies parameters	Conclusion
Cruz A.T. et al. Pediatrics. 2011. USA [25]	Retrospective observational	193	Protocol introduction for treatment septic shock	Introduction the protocol reduces the time for prescribing adequate antibiotic and infusion therapy
Larsen G.Y. et al. Pediatrics. 2011. USA [26]	Retrospective observational	642	Protocol introduction for treatment septic shock	Introduction the protocol reduces the duration of hospital treatment
Paul R. et al. Pediatrics. 2012. USA [27]	Prospective observational	126	Introduction protocols of infusion, inotropic and antibiotic therapy	Adherence to the implementation of the recommendations is less than 40 %. When using all the recommendations, the duration of treatment in a hospital is reduced by 57 %
Weiss S.L. et al. Crit Care Med. 2014. USA [28]	Retrospective observational	113	Introduction protocols antibiotic therapy	Delayed antimicrobial therapy is an independent risk factor for death and long-term organ dysfunction
Akcan Arkan A. et al. J Pediatr. 2015. USA [29]	Retrospective observational	202	Assessing the Impact of Implementing a Septic Shock Treatment Protocol on Acute Kidney Injury Incidents	Introduction of the protocol was associated with a decrease in the incidence of acute kidney injury (54 % vs 29 %, $p < 0.001$), renal replacement therapy (4 vs 0, $p = 0.04$), duration of treatment in the ICU, hospital (1.9 ± 2.3 vs 4.5 ± 7.6 , $p < 0.01$, 6.3 ± 5.1 vs 15.3 ± 16.9 , $p < 0.001$, retrospectively) and mortality (10 % vs 3 %, $p = 0.037$)
Balamuth F. et al. Pediatr Crit Care Med. 2016. USA [30]	Retrospective observational	189	Introduction protocol of treatment sepsis	When using the protocol already in the emergency department, the likelihood of developing organ dysfunction on the 2 nd day of hospital treatment was significantly reduced (odds ratio [OR] 4.2; 95 % CI 1.7–10.4)
Workman J.K. et al. Pediatr Crit Care Med. 2016. USA [31]	Retrospective observational	321	Relationship between adherence to sepsis treatment protocol and outcomes	The syndrome of progressive multiple organ dysfunction developed in 9 (7.7 %) patients treated according to the recommendations and in 25 (12.3 %) children in whom the therapy did not comply with the protocol ($p = 0.26$). Lethal outcome occurred in 17 (5 %) children. There were no statistically significant differences in survival between groups
Fernandez-Sarmiento J., et al. Pediatr Crit Care Med. 2018. Columbia [32]	Retrospective observational	236	Assessment of adherence to the treatment of sepsis according to the protocol before and after the implementation of the educational program	In the group after intervention, there was a reduction in the duration of hospital treatment (11.6 days vs 7.9 days; $p = 0.01$), time to fluid bolus administration (247 min vs 5 min; $p = 0.001$), and the use of the first dose of antibiotic (343 min vs 271 min; $p = 0.03$) and a decrease in the need for mechanical ventilation (20.1 % vs 7.5 %; $p = 0.01$). Protocol adherence after the intervention was 27.7 % vs 19.2 % ($p = 0.17$)
Moresco B.L. et al. Front Pediatr. 2018. Brazil [33]	Retrospective observational	43	Assessment of adherence to the treatment of sepsis according to the protocol before and after the implementation of the educational program	Adherence to therapy was less than 30 %

Author, magazine, publication year	Design	n	Studies parameters	Conclusion
Evans I.V.R. et al. JAMA 2018. USA [34]	Retrospective observational	1179	Evaluation of the impact of the introduction of the protocol of the first hour of sepsis treatment on hospital mortality	Introduction of all sepsis management recommendations within the first hour is associated with a lower likelihood of hospital mortality (OR 0.59 [95 % CI 0.38–0.93], $p = 0.02$); however, implementation separately protocol element was not significantly associated with lower mortality (blood culture: OR 0.73 [95 % CI 0.51–1.06], $p = 0.10$; RD 2.6 % [95 % CI –0.5 ... +5.7 %]). Antibiotics: OR 0.78 [95 % CI 0.55–1.12], $p = 0.18$; RD 2.1 % [95 % CI –1.1 ... +5.2 %], fluid bolus: OR 0.88 [95 % CI 0.56–1.37], $p = 0.56$; RD 1.1 % [95 % CI –2.6 ... +4.8 %])
Long E. et al. Front. Pediatr. 2021. Brazil [35]	Retrospective observational	548	Evaluation of the relationship between the introduction of a sepsis treatment protocol and a decrease in mortality, prevention of septic shock and organ dysfunction	From patients where using the protocol had a shorter duration of ICU treatment (3 days vs 11 days; $p < 0.001$), fewer organ systems involved in MODS (0 vs 2, $p < 0.001$), and a lower likelihood of developing septic shock. Mortality was lower after protocol implementation [2.75 vs 15.4 % (RR 95 %, 0.13 (0.06, 0.27); $p < 0.001$)]
Harley A. et al. Critical Care Explorations. 2021. Australia [36]	Multicentre observational prospective	523	Treatment compliance with the protocol and its timeliness	The adherence to the implementation of the protocol was 40 %
Lorton F. et al. JAMA Network Open. 2022. France [37]	Multicentre observational prospective	259	Compliance with treatment protocol	Inadequate medical care was more identified in surviving children with complications (OR 5.61; 95 % CI 1.19–26.36) and in children who died (OR 0.16; 95 % CI 0.04–0.65) compared with uncomplicated survivors

Coordinator resulted in improved compliance in a four-year pilot program in London [38]. I.V.R. Evans et al. (2018) found differences in the implementation of mandatory elements of the protocol for the treatment of sepsis in children in New York [34].

Today, there is little data on the factors that ensure the success of the implementation of programs for the treatment of sepsis in children. However, according to N. Roberts et al., they are associated with the need for educational activities and subsequent changes in the daily activities of the medical staff of clinics [39].

Thus, practical doctors in treatment children with sepsis sometimes meet barriers that can ultimately affect the quality of care and outcome. These include the following reasons:

1. Factors of risk (initial status of the patient, concomitant diseases: congenital malformations, malnutrition, anemia, bronchopulmonary dysplasia, etc.);
2. Pre-hospital factors (delayed diagnosis, non-compliance with routing schemes, limited resources of the medical institution);
3. Hospital factors (insufficient staff and volume of specialized services, lack of equipment, monitoring, medicines. Significant disparities in access to health care,

availability of resources, care delivery, and limited evidence base mean that many of the current recommendations «Surviving Sepsis Campaign» are not applicable or feasible in clinics with limited funding [40, 41].

On opinion F. Lorton et al. (2022) inadequate intensive care measures may be associated with the following:

- 1) delayed ask for medical care by the child's parents;
- 2) inadequate assessment of the severity of the child's condition by medical personnel;
- 3) late prescription of antibacterial drugs, irrational dosing and frequency;
- 4) non-compliance with the recommended timing and volume of bolus fluid administration;
- 5) inadequate clinical assessment of the dynamics of the state after a bolus of fluid [41].

To exist next independent factors of irrational treatment: the age of children less than 5 years (RR 3.15; 95 % CI 1.25–7.90), the diagnosis of sepsis without an established source of infection (RR 5.77; 95 % CI 1, 64–20.30) or meningitis (RR 3.39; 95 % CI 1.15–9.96); inadequate assessment of the severity of the condition by the primary care physician (OR 3.22; 95 % CI 1.17–8.88) [36].

Table 2. Alleged problems in the implementation of recommendations for the treatment of pediatric sepsis in the clinical practice of domestic medical organizations

Screening, diagnosis and systematic treatment for sepsis
■ Lack of a reliable clinical method for diagnosing sepsis, septic shock with organ dysfunction including in newborns
■ Differences in the structure of sepsis in different regions
■ Inadequate assessment of the severity of the condition of patients in intensive care units
■ Limited use of validated childhood mortality prediction models to identify patients at risk
■ Lack of consensus on diagnostic criteria for shock
■ Limited possibilities of laboratory diagnostics for diagnosing infections, acute respiratory viral infections, multiple organ dysfunction syndrome, measuring the concentration of lactate in the blood, bacteriological tests
Antibiotic therapy
■ Increased resistance to antibiotics
■ Undocumented use of antibiotics by the patient before hospitalization
■ Limited possibilities of laboratory for selection of antimicrobial therapy, which leading to overtreatment
■ Lack of a robust federal system for the development and supply of new antibiotics
■ Frequent empiric use of antibiotics
■ The impossibility of accurate dosing of antibiotics for renal and hepatic insufficiency, depending on the concentration of the drug in blood plasma
Infusion therapy
■ Limited ability to minimize complications that occur with aggressive volemic exercise. (fluid overload, capillary loss syndrome, electrolyte disturbances)
■ Limited ability to dynamically control weight in children older than one year
Hemodynamic monitoring
■ Limited ability to hemodynamic monitoring, lack of ability to measuring the concentration of lactate in all medical organizations
Respiratory support
■ Lack of ability for continuous measurement tension carbon dioxide, oxygen in the end of expiration
■ Limited recommendations on the effective of non-invasive mechanical ventilation in sepsis (especially in neonates and young children)
■ Lack of equipment for invasive and non-invasive mechanical ventilation
Nutrition support
■ Feeding through a nasogastric tube is often not regulated due to the need for equipment and the lack of medical personnel (organizations of the 1 st and 2 nd levels)
■ Lack of technical ability to elevate the head end of the bed, which increases the risk of aspiration and ventilator-associated pneumonia
Blood transfusion
■ The purpose of transfusion of blood components isn't always clearly defined
Plasma exchange and extracorporeal hemocorrection
■ Renal replacement therapy and extracorporeal membrane oxygenation are rarely used in children with sepsis
Immunoglobulin
■ Limited access to parenteral polyclonal immunoglobulin drugs

Based on our own clinical experience, we present in Table 2 a list of expected difficulties which may arise in the implementation of clinical guidelines for the treatment of sepsis in children (especially in first- and second-level medical hospitals). However this is only our expert opinion and the provisions we have highlighted need clinical confirmation.

The need in treat children with sepsis who are in critical condition and need intensive care will always exist. Ensuring a balance between the expediency of using expensive, resource-intensive intensive care measures and the implementation of educational programs to improve the skills of medical personnel in hospitals should become an integral part of the global tactic to improve the outcomes of sepsis in children [42].

Modern clinical guidelines, based on high-quality research and developed to improve the quality of care for a child in critical condition, can be the standard of intensive care in the treatment of sepsis in children [43]. For this, it is fundamentally important to develop and introduction local protocols for the treatment of sepsis, septic shock and multiple organ dysfunctions in children. It should be understood that the provision of emergency care for sepsis does not always require a specialized intensive care unit with a large number of resources. The main is the formation of a highly qualified team of specialists who are ready to make an informed choice and make an informed decision in the treatment of critically patients based on the available recommendations [44].

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Conclusion

Analysis of current data suggests that the overall adherence to clinical recommendations of real intensive care for sepsis from children remains extremely low and does not reach 40% even in developed countries. However, when patients were treated according to available protocols, outcomes were better. It is likely that not only the introduction of sound protocols for its treatment into the practice of pediatric intensive care units, but also the implementation of a strategy aimed at effectively overcoming mental barriers to making a justified clinical decision can help improve the results of sepsis treatment in children.

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