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Role of the respiratory physiotherapist and kinesiologist in Pediatric Emergency Medicine

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Abstract

Kinesiology, or physical therapy, is a dynamic and continually evolving discipline that has gained significant importance in healthcare. Its relevance became particularly evident during the polio epidemic of the 1950s, when respiratory therapy emerged and specialists began integrating into intensive care teams. However, their role in Pediatric Emergency Departments remains limited and less explored.

Objective: To highlight the collaboration between physical therapists and pediatric emergency care providers as a strategy to enhance the quality of care for critically ill patients.

Conclusion: Integrating pediatric physical therapists with specialized emergency care training could be a key factor in optimizing the management of Pediatric Emergency Departments.

ROL DEL FISIOTERAPEUTA-KINESIÓLOGO RESPIRATORIO EN URGENCIAS PEDIÁTRICAS

Resumen

La kinesiología o fisioterapia es una disciplina en constante evolución, cuya importancia ha crecido significativamente en el ámbito de la salud. La fisioterapia respiratoria adquirió relevancia en los años 50 durante la epidemia de poliomielitis y los especialistas se integraron progresivamente a los equipos de Cuidados Intensivos. Sin embargo, su participación en los servicios de Urgencias Pediátricas es limitada y menos explorada.

Objetivo: *Difundir la colaboración entre fisioterapeutas y pediatras de Urgencias como estrategia de mejora en la calidad de atención de los pacientes en situaciones críticas.*

Conclusión: *Integrar al kinesiólogo pediátrico con formación en urgencias podría ser una decisión importante a ser considerada en la gestión de los Servicios de Emergencias.*

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INTRODUCTION

Kinesiology, or physical therapy, is a continually evolving discipline that has gained significant importance in healthcare. Since its emergence in the 20th century, the profession has consistently adapted to meet the demands of changing historical and professional contexts[1].

In the 1950s, poliomyelitis affected millions of people worldwide, leaving many with severe motor and respiratory sequelae. This challenge led to the evolution of physical therapy, from a set of empirical techniques to a more structured and specialized professional practice[2].

Over time, one of the most significant advancements was the formalization of kinesiology as an independent discipline. Universities began offering postgraduate programs, enabling students to form. This academic recognition marked a key milestone in the development and dissemination of the profession.

By the late 20th century, specialists became actively integrated into intensive care teams, focusing on the care and rehabilitation of critically ill patients. In several countries, including Argentina, chapters and committees were established within intensive care societies to further specialize these professionals[1].

This development and professionalization of kinesiologists in intensive care has been remarkable[3-5]. Nevertheless, their participation in Pediatric Emergency Departments (PED), where they can play a key role in the care of children with acute respiratory diseases, remains limited and underexplored. Greater awareness and recognition of the valuable contributions these specialists can offer in this setting are needed.

Global reports indicate that approximately 30% of emergency department visits involve children[6]. The particular vulnerability of these patients in their vital systems during emergencies, along with their differences from adults, warrants the development of optimal care standards and practices. Managing pediatric patients remains one of the most significant challenges in emergency medicine, requiring a healthcare team specifically trained to provide the highest level of care.

Respiratory therapy is a specialized branch of physical therapy focused on the treatment and rehabilitation of respiratory diseases. A respiratory kinesiologist, or respiratory physiotherapist (RPT)*, is a university-trained professional with expertise in evaluating, treating, and managing patients with respiratory conditions[1]. These specialists, trained in pediatrics, play a crucial role in care, particularly in hospital settings, where they collaborate closely with other healthcare team members to provide comprehensive patient care.

In some PEDs, RPTs have become key members of the healthcare team for children with acute conditions. Beyond performing functional evaluations and administering respiratory therapies, they play an active role in clinical decision-making, manage respiratory support devices, and educate both patients and their families. Their contributions are crucial in optimizing respiratory function in critically ill children, which improves recovery outcomes and reduces hospital stay duration.

At the Hospital de Pediatría Prof. Dr. Juan P. Garrahan in Buenos Aires, Argentina, which receives 120,000 consultations annually for children with acute conditions, RPTs have been integrated as essential members of the multidisciplinary emergency department team.

This article will discuss the importance of incorporating these professionals into the care of critically ill children, highlighting their roles and the significance of teamwork. Our aim is to promote the collaboration between RPTs and pediatric emergency medicine physicians as a strategy to enhance the quality of care for critically ill patients.

PEDIATRIC RESPIRATORY PHYSIOTHERAPIST TRAINING AND SCOPES OF PRACTICE

The university training program in kinesiology or physical therapy typically lasts 5 to 6 years, depending on the country7. The curriculum includes many subjects shared with medical programs, such as anatomy, physiology, histology, medical-kinesiological semiopathology, psychology, and chemistry, as well as other courses specific to the discipline. The degree awarded by the University of Buenos Aires, Argentina, is Bachelor in Kinesiology and Physiatry.

After graduation, professionals can opt for a specialty through a residency program or fellowship in various areas such as pediatrics and neonatology, neurorehabilitation, cardiorespiratory rehabilitation, traumatology, and intensive care. Other advanced training alternatives include postgraduate programs in vestibular rehabilitation, sports kinesiology, pediatric and adult intensive care, early stimulation, and psychomotor skills.

RPTs with a residency in pediatrics and neonatology have the knowledge, skills and capabilities to work with children, who have unique patterns and responses compared to adults. Proper evaluation of an acutely ill child requires specialized knowledge of anatomy, physiology, growth, and developmental stages. Traditional techniques for caring for adult patients may not be appropriate for use in the pediatric population[6].

During their training, pediatric RPTs acquire knowledge and skills in: a) anatomy, pathophysiology, diagnosis and treatment of various pediatric diseases and clinical syndromes; b) basic vital function monitoring and cardiopulmonary resuscitation; c) airway management; d) oxygen therapy and aerosol administration; e) bronchial hygiene therapy; f) basic principles of mechanical ventilation, infection control, and pharmacology; and g) safety, comfort, and positioning measures.

Competencies for RPTs working in Intensive Care Units (ICU) have been well developed and many of them can be applied to PEDs (Table 1); for example, the competencies

In the hospital setting and specifically in emergencies, the names of professionals specialized in physiotherapy or respiratory kinesiology may vary depending on the region. For example, in Spain it is known as a respiratory physiotherapist, in Mexico, a respiratory therapist, in Chile, a respiratory kinesiologist, etc. In summary, although terminology may vary, in the hospital and emergency context, these professionals are generally known as physiotherapists or respiratory therapists, depending on the country.

TABLE 1. Competencies of the RPT.

Management of the high-flow nasal cannula (HNFC)
- Patient selection according to institutional guidelines
- HNFC implementation: selection of the device, circuit, and cannula
- HNFC programming: Flow and fraction of inspired oxygen (FiO_2)
- Patient and device monitoring
- Criteria for success and failure according to institutional guidelines

Management of non-invasive ventilation (NIV)
- Patient selection according to institutional guidelines/ protocols
- Selection of device, circuit and interface, need for humidification and aerosols
- Programming: ventilatory mode, FiO_2, inspiratory/expiratory pressures, inspiratory time
- Patient monitoring: clinical, blood gases, vital signs, patient-ventilator interaction
- Failure and success criteria

Management of invasive ventilation (VI)
- Implementation of institutional guidelines/protocols
- Device selection
- Respiratory circuit selection, calibration, humidification and aerosol delivery
- Programming and settings of ventilatory parameters: Mode, FiO_2, expiratory pressure, tidal volume, inspiratory time, inspiratory pressure
- Monitoring: ventilatory mechanics, alarms, clinical, vital signs, capnography, and acid-base status

Modified from: Gogniat E, et al.[1].

TABLE 2. Most frequent conditions and interventions managed by the RPT in the Emergency Department.

DISORDERS	Bronchiolitis	• Clinical assessment • Bronchial hygiene • Oxygen therapy and ventilation management
	Asthma	• Clinical assessment • Management of aerosol therapy • Breathing exercises • NIV and IMV according to need
	Neuromuscular disease	• Respiratory and muscular assessment • Assisted bronchial hygiene • Prevention of complications • Optimization of chronic NIV
	Cystic fibrosis	• Aerosol therapy and/or nebulization management • Secretion culture • Oxygen therapy • Specific techniques for bronchial hygiene
	Tracheostomy	• Clinical assessment • Oxygen therapy • Humidificación de secreciones • Cannula change and caregiver education • Bronchial hygiene • MV according to need

NIV: noninvasive ventilation; IMV: invasive mechanical ventilation; MV: mechanical ventilation.

outlined by the Argentine Society of Intensive Care y Gogniat et al.[1].

PARTICIPATION OF THE RPT IN THE EMERGENCY MEDICINE TEAM

It is important to note that RPTs are consulted when the pediatric emergency physician determines, through an objective evaluation, that specialized intervention is needed. The most frequent reasons for consultation involve acute respiratory conditions and exacerbations of chronic neuromuscular and neurological disorders. Commonly observed conditions include (Table 2):

- Bronchiolitis: While respiratory physiotherapy is not a standard treatment for bronchiolitis, RPTs may collaborate with the healthcare team to assess the severity and determine the most appropriate therapeutic approach. When needed, they may perform bronchial hygiene techniques, manage high-flow nasal cannula (HFNC) placement, and/or recommend the initiation of NIV.
- Asthma exacerbation: RPTs assess the severity of an asthmatic crisis using a standardized severity score, ensure the correct administration of aerosol therapy, and educate patients and their caregivers. In addition, they use respiratory exercises to enhance mucociliary clearance, including active respiratory cycling and manual techniques to support exhaled airflow. For children that are unresponsive to initial measures, the RPTs proceed with the setup, programming, and application of NIV or IV, as required.
- Neuromuscular diseases (NMD): Both acute NMD in previously healthy patients and chronic conditions presenting with respiratory distress are managed in the emergency department.

  In children with acute conditions, such as Guillain-Barré syndrome, botulism, or acute myelitis, the initial assessment focuses on respiratory mechanics, vital signs, and the potential need for NIV or mechanical ventilation. General muscle strength is measured using assessment scales, including the Medical Research Council (MRC) scale, together with evaluation of swallowing function and the risk of bronchial aspiration. Identifying appropriate bronchial hygiene techniques is essential to stabilize these patients and prevent complications, such as atelectasis.

  In chronic conditions, such as spinal muscular atrophy, Duchenne muscular dystrophy, myasthenia gravis, and congenital muscular dystrophies, evaluation and treatment focus on the management of respiratory exacerbations and prevention of complications. This involves a comprehensive assessment of respiratory function and tailoring bronchial hygiene therapy to the specific needs of each patient. Interventions also include optimizing chronic and/or home NIV and re-evaluating the bronchial hygiene techniques used at home to ensure the best possible care.
- Cystic fibrosis (CF): During respiratory exacerbations, the patient's need for oxygen, aerosol therapy, specific neb-

ulizations, and bronchial hygiene techniques is carefully assessed. Additionally, secretion samples are collected for culture to guide appropriate treatment.

Special attention should be given to children with tracheostomies, as this artificial airway requires careful evaluation. Excessive secretions can lead to respiratory distress and hypoxemia. RPTs assess the need for oxygen therapy, selecting passive or active humidification with oxygen as appropriate. They also perform cannula changes and play an active role in educating caregivers on proper airway management.

INTERVENTIONS IN THE EMERGENCY DEPARTMENT

The following interventions should be performed according to institutional care guidelines and protocols:

1a. Participation in the initiation of HFNC: Despite ongoing debate, many children with bronchiolitis are started on HFNC systems in the emergency department if initial measures, such as comfort care, prove ineffective. RPTs are responsible for monitoring and triaging patients in accordance with institutional protocols

1b. Initiation of NIV: In recent decades, the use of NIV for patients with severe acute respiratory failure in the emergency department has become more common. Timely initiation of NIV can enhance prognosis and reduce the need for invasive ventilation, which is associated with higher comorbidity rates (Figure 1). The role of the RPT in this process is outlined in Table 1.

1c. Initiation of invasive mechanical ventilation: In cases where NIV fails, sensory impairment or imminent respiratory failure occurs, and orotracheal intubation (OTI) is considered necessary, it is crucial to prepare all elements required for airway management. This includes verifying the correct size of the resuscitation bag and mask, ensuring the operation of the secretion aspiration system, setting up and programming the ventilator, and monitoring capnography (Table 1). The RPT also participates in ensuring the safe transfer of the patient to the ICU, maintaining continuity of respiratory support throughout the process.

Bronchial hygiene

Bronchial hygiene is a critical and multifaceted intervention in the management of pediatric patients in the PED[8]. The techniques used aim to optimize mucociliary clearance, facilitate expectoration, and improve ventilation, and they can be applied individually or in combination. The most frequently utilized and accessible techniques in the PED include the following:

FIGURE 1. An emergency physical therapist/kinesiologist assists in the initiation of non-invasive ventilation (NIV) for a child with neuromuscular disease.

- Aspiration of secretions: performed in patients who are unable to clear them effectively, such as those with bronchiolitis, an artificial airway, or a diminished or absent cough reflex. The procedure is performed using an aspiration tube, with careful attention to prevent complications such as hypoxia or airway injury.
- Peripheral techniques: these techniques help mobilize secretions from the peripheral to the central airways, facilitating their expulsion. These techniques are particularly beneficial for patients with chronic respiratory diseases and can be categorized into two types: manual and instrumental. Both types share the same goals—improving ventilation, clearing secretions, and promoting their movement toward the central airways. The most commonly used techniques in this context include manual methods such as expiratory flow acceleration and assisted autogenic drainage**[8-10].
- Cough assist: Cough assist is essential for patients with muscle weakness and can be performed manually or with mechanical devices such as the 'CoughAssist' or mechanical cough assistant (MCA). Manual assistance involves the therapist applying pressure in sync with the patient's cough. To execute this effectively, pressure is applied consistently and rapidly, with one hand positioned at the abdomen and the other on the rib cage near the sternum.

***The expiratory flow acceleration (EFA) technique involves the RPT positioning their hands on the patient's rib cage. Initially, the RPT assesses the patient's breathing pattern. During expiration, the RPT accompanies the chest movements by applying light pressure. This maneuver increases respiratory airflow, which is crucial for effective mobilization of secretions. EFA is a versatile technique that is especially useful in the management of respiratory conditions. Assisted Autogenous Drainage (AAD) is a passive technique used in infants and young children. It involves external compression of the chest wall to manipulate lung volume and maximize expiratory flow. During the procedure, the RPT applies gentle manual pressure to the thorax with each inspiration. As the respiratory cycles progress, the RPT progressively restricts thoracic expansion during the inspiratory phase. This approach encourages the patient to exhale longer and more forcefully in each cycle, thereby facilitating secretion mobilization.*

FIGURE 2. Manual cough assistance in a girl with spinal muscular atrophy.

FIGURE 3. Team of emergency physical therapists providing inspiratory support with a resuscitation bag for a girl with a tracheostomy and acute respiratory infection.

Depending on the patient's cooperation, either a voluntary cough can be instructed or a reflex cough effort can be detected. The MCA, in contrast, is an electronic device programmed by the therapist to adjust settings such as pressures, usage modes, inspiratory and expiratory times, and flow rates. It operates with a circuit that includes an antibacterial filter, tubing, and a silicone mask tailored to the patient's size. The device provides a sequence of positive and negative pressure to simulate and assist with an effective cough[10] (Figure 2).

- Inspiratory assist: this technique, although extensively documented in patients with NMD, can benefit any patient with limited inspiratory capacity.8 The primary aim of this technique is to enhance lung volumes, optimize airflow, and improve overall lung capacity. It can be administered using various methods, including manual bag hyperinflation, MCA, and NIV (Figure 3)[1,8].
- Active cycle of breathing technique (ACBT): this technique consists of three key components to aid in the mobilization and clearance of secretions: diaphragmatic breathing, thoracic expansion, and forced expiration. The technique is applied in cycles, with the duration of each component adjusted according to the patient's needs. ACBT can be introduced as a game from the age of 2 years, but is applied as a bronchial hygiene technique from the age of 8-9 years. ACBT can be performed in different decubitus positions and, in some cases, may be combined with NIV[1].

The team of the PED of the Hospital J. P. Garrahan in Argentina includes two RPTs. In 2023, they cared for 1,031 patients, with a peak in admissions occurring between May and September. Of these patients, 54% had complex chronic conditions, with the most common being respiratory diseases (16%), neurological disorders (15%), genetic diseases (12%), and NMD (4%). Notably, due to their unique care and therapeutic needs, 30 patients with CF), 10 with spinal muscular atrophy, and 138 children with tracheostomies were of particular significance. Of these, cannula changes were performed for 55 patients, either on an emergency or scheduled basis. RPTs were actively involved in the implementation, monitoring, and therapeutic management of 301 patients receiving HFNC therapy, 44 patients on NIV, and 18 patients undergoing intubation.

CONCLUSION

Incorporating a respiratory physiotherapist with training in emergency medicine could be a significant enhancement in the management of PEDs. Their specialized expertise in performing targeted assessments and treatments contributes to optimizing patient care and recovery. Our experience may serve as a model for achieving higher standards of care.

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