

Clinical profile and the role of Physical Therapy for patients treated at the pediatric emergency of a public hospital in Goiás

Perfil clínico e atuação fisioterapêutica em pacientes atendidos na emergência pediátrica de um hospital público de Goiás

Perfil clínico y actuación fisioterapêutica en pacientes atendidos en la emergencia pediátrica de un hospital público de Goiás, Brasil

Sara Alves dos Santos Taquary¹, Débora Santos Ataíde¹, Priscila Valverde de Oliveira Vitorino²

ABSTRACT | In recent years, the role of Physical Therapy has gained strength in the emergency departments to reduce complications and time of hospital stay. The objectives of this study were to describe the profile of patients admitted at the resuscitation room of the Pediatric Emergency Reference Service (SERUPE) of Hospital das Clínicas of Universidade Federal de Goiás (HC/UFG), and to characterize the role of Physical Therapy in this sector. This is an observational and prospective study, conducted between February and June 2012, in which all of the patients admitted to the resuscitation room of SERUPE were monitored. Forty-seven patients were evaluated, being 53.2% (n=25) male, mean age of 5.2±4.1 years old, and 74.5% (n=35) had previous diseases. The most common complaint was dyspnea, in 26.1% (n=29) of the cases, and the most identified diagnostic hypotheses were respiratory disease in 69.4% (n=43) of the participants. Of all patients, 76.6% (n=36) needed oxygen therapy, 21.3% (n=10) needed ventilatory support, and 31.9% (n=15) had physical therapy care, 86.7% (n=13) with chest associated to motor physiotherapy. The mean time of permanence in the resuscitation room was 1.9±1.5 days; thereafter, 63.8% (n=30) of the patients were hospitalized to the ward. Therefore, it was verified that in the emergency departments there is great demand of patients with respiratory disorders who may benefit from the presence of a physical therapist.

Keywords | emergency medical services; Physical Therapy Specialty; child.

RESUMO | Nos últimos anos, tem-se ampliado a atuação fisioterapêutica no setor de urgência e emergência, visando reduzir complicações e tempo de internação hospitalar. Os

objetivos deste estudo foram traçar o perfil dos pacientes admitidos na sala de reanimação do Serviço de Referência em Urgência Pediátrica (SERUPE) do Hospital das Clínicas da Universidade Federal de Goiás (HC/UFG) e descrever a atuação fisioterapêutica nesse setor. Trata-se de um estudo observacional, prospectivo, realizado entre fevereiro e junho de 2012, para o qual foram acompanhados todos os pacientes admitidos na sala de reanimação do SERUPE. Foram avaliados 47 pacientes, 53,2% (n=25) do sexo masculino, idade média de 5,2±4,1 anos e 74,5% (n=35) apresentavam doenças prévias. A queixa principal mais frequente foi dispneia em 26,1% (n=29) dos casos e as hipóteses diagnósticas mais identificadas foram doenças respiratórias em 69,4% (n=43). Do total de pacientes, 76,6% (n=36) necessitaram de oxigenoterapia, 21,3% (n=10), de assistência ventilatória e 31,9% (n=15) tiveram acompanhamento fisioterapêutico, 86,7% (n=13) com abordagem respiratória e motora. O tempo médio de permanência na sala de reanimação foi de 1,9±1,5 dias; subsequentemente, 63,8% (n=30) dos pacientes foram internados em enfermaria. Portanto, verifica-se que, no setor de emergência, existe uma grande demanda de pacientes com desordens respiratórias que podem se beneficiar com a presença de um fisioterapeuta.

Descritores | serviços médicos de emergência; Fisioterapia; criança.

RESUMEN | En los últimos años, la actuación fisioterapêutica tiene sido ampliada en el sector de urgencia con el objetivo de reducir las complicaciones y el tiempo de internación hospitalaria. Los objetivos de este estudio fueron reportar el perfil de los pacientes admitidos en la sala

Study conducted at the Pediatric Emergency Reference Service (SERUPE) of Hospital das Clínicas at Universidade Federal de Goiás (UFG) - Goiânia (GO), Brazil.

¹Program of Multiprofessional Residency in Health of Hospital das Clínicas at UFG (Urgency and emergency) - Goiânia (GO), Brazil.

²Physical Therapy course of Pontifícia Universidade Católica de Goiás (PUC Goiás) - Goiânia (GO), Brazil.

Correspondence to: Sara Alves dos Santos Taquary - Rua MDV-01, Qd-09, Residencial Ventana, bloco 07, apto. 503, Setor Moinho dos Ventos - CEP: 74371-445 - Goiânia (GO), Brasil - E-mail: alves_sasa@hotmail.com
Presentation: Feb. 2013 - Accepted for publication: Aug. 2013 - Financing source: none - Conflict of interests: nothing to declare - Approval at the Ethics Committee n. 078/2011 (HC/UFG).

de reanimación del Servicio de Referencia en Urgencia Pediátrica (SERUPE) del Hospital das Clínicas de la Universidad Federal de Goiás (HC/UFG) y describir la actuación fisioterapéutica en este sector. Estudio observacional, prospectivo, realizado entre febrero y junio del 2012, para lo cual fueron acompañados todos los pacientes admitidos en la sala de reanimación del SERUPE. Fueron evaluados 47 pacientes, incluyendo el 53,2% (n=25) del género masculino, con edad media de 5,2±4,1 años y el 74,5% (n=35) presentaba enfermedades previas. La más frecuente queja fue disnea en el 26,1% (n=29) de los casos y las hipótesis diagnósticas que fueron más identificadas fueron enfermedades respiratorias en el

69,4% (n=43). Del total de pacientes, el 76,6% (n=36) necesitó de oxigenoterapia, el 21,3% (n=10) de asistencia ventilatoria y el 31,9% (n=15) tubo acompañamiento fisioterapéutico, el 86,7% (n=13) con abordajes respiratorio y motor. El periodo medio de permanencia en la sala de reanimación fue de 1,9±1,5 días; subsecuentemente el 63,8% (n=30) de los pacientes fueron internados en enfermería. Por lo tanto, se verificó que en el sector de urgencia hay una gran demanda de pacientes con disturbios respiratorios, los cuales pueden beneficiarse con la presencia de un fisioterapeuta.

Palabras clave | servicios médicos de urgencia; Fisioterapia; niño.

INTRODUCTION

Emergency and urgency hospital units are part of the hospital component of the attention system, established in 2006 by the National Urgency and Emergency Policy.

According to the Ministry of Health, the emergency room is a health facility that assists the users, at risk of death or not, whose health problems require immediate care. They work 24 hours a day and provide observation beds destined to patients who need to be under medical and/or nursing supervision for diagnostic or therapeutic purposes for less than 24 hours¹.

Due to the difficulty to access the basic attention network, many parents seek urgency hospital departments in order to treat their children, thus generating increasing demand due to clinical conditions that are not urgent. This situation has a considerable influence on the work process and on the quality of the provided health service^{2,3}.

However, at times the demand extrapolates the resolution capacity of the services. Therefore, resuscitation and observation rooms, which are dedicated to the temporary permanence of patients, become admission areas, without the adequate infrastructure and staff conditions for continuous care⁴.

The assistance in emergency units is marked by unpredictability, and, especially in major urban centers, where the demand is high, there is the tendency for the creation of a multiprofessional team, in which several professionals work together in order to improve the quality of the provided service, aiming at the preservation of life⁵.

The importance to integrate and articulate different professional categories is noteworthy, based on the cooperation and exchange of knowledge to favor the proper assistance to the users in urgency and emergency situations⁶. In this context, in 2000, *Hospital Estadual*

do Grajaú, in São Paulo, had its first experience by integrating the Physical Therapy service to the team working in the emergency sector⁷.

The insertion of the physical therapist in the emergency room is recent in some Brazilian hospitals. However, the Physical Therapy service has been proving to be beneficial, reflecting a faster and more efficient treatment, lower rates and time of orotracheal intubation and invasive mechanical ventilation, less complications, infections and shorter hospital stay⁷.

This study aimed to determine the profile of patients admitted to the resuscitation room of the Pediatric Urgency Reference Service (SERUPE) at *Hospital das Clínicas of Universidade Federal de Goiás (HC/UFG)*, as well as to describe the role of physical therapy in the resuscitation room.

METHODOLOGY

This article is part of a research project approved by the Ethics Committee of HC/UFG (Protocol n. 078/2011).

HC/UFG is a general public teaching hospital, reference for tertiary health care and connected to the Unified Health System (SUS). SERUPE counts on a 378.88 m² area, 4 offices, 2 wards with 10 beds, waiting room, rooms for medication, procedures and resuscitation.

This is an observational prospective study, with quantitative data analysis and descriptive analysis, performed from February to June, 2012. Children aged from 0 to 14 years old admitted to the resuscitation room of SERUP during data collection (convenience sample) were included. Patients who entered or left the emergency sector (due to hospital

discharge, death, evasion or transfer to another sector) when the researchers were not in the emergency room were excluded.

Data were collected six times a week (from Monday to Saturday) during the morning and afternoon periods.

Data were obtained from three sources: data collection form (interview with parents/legal responsible party of the child); review of medical records; and registration books of admission units.

The following sociodemographic and health data were obtained: age, gender, date of hospital admission, time of stay in the resuscitation room, main complaint, diagnostic hypothesis, history of pathology, need for oxygen therapy and/or ventilatory support, role of physical therapy and destination of the patient (hospital discharge, ward, intensive care unit – ICU, external transfer and death).

Diagnostic hypotheses and pathological history were divided into groups of diseases: cardiovascular, endocrinological, gastrointestinal, genitourinary, hematological, nephrological, neurological and rheumatologic disorders, sepsis and domestic accidents.

Patients who were already registered in the data base of the research and were readmitted at another date were registered again, and considered as new patients.

Data were typed into and analyzed in Microsoft Excel 2007®. Descriptive statistics was used for data analysis.

RESULTS

In the period of data collection, 54 patients were admitted to the resuscitation room of SERUP, and 7 were excluded. Therefore, 47 patients composed the sample, being 53.2% (n=25) male patients, mean age of 5.2±4.1 years old, and mean time of stay in the resuscitation room of 1.9±1.5 days.

Several patients presented with more than one complaint (mean of 2.4±1.0 reported complaints). The most common main complaints were dyspnea, in 26.1% of the cases (n=29), fever, in 10.8% of the cases (n=12), cyanosis, in 7.2% of the cases (n=8), and sibilance in 7.2% of the cases (n=8).

Some patients had more than one diagnostic hypothesis, and mean was 1.3±0.6 (Figure 1).

The most prevalent diseases were respiratory ones, in 69.4% (n=43) of the cases, distributed as follows: asthmatic crisis – 32.6% (n=14), pneumonia – 30.2%

(n=13), bronchospasm – 11.6% (n=5), upper airway infection – 7.0% (n=3).

As to medical history, 25.5% (n=12) of the patients had been previously healthy. Out of the total, there were 48 cases of pathological history, with mean of 1.0±0.8 previous pathology per patient. Most prevalent conditions were respiratory and neurological disorders, affecting 31.3% (n=15) of the patients each (Figure 2).

Out of the 47 assessed patients, 76.6% (n=36) needed oxygen therapy. Ventilatory support was necessary for 21.3% of the patients (n=10), by means of invasive mechanical ventilation (IMV) or non-invasive mechanical ventilation (NIV). From the sample, 31.9% (n=15) had physical therapy follow-up (Figure 3).

Among the patients who underwent respiratory physical therapy (n=13), all of them were submitted to therapy for secretion removal (TSR). All of the patients (n=15) who underwent motor physical therapy were placed on the bed (Figure 4).

Concerning the outcome, 63.8% (n=30) of the children were subsequently admitted to the ward (Figure 5).

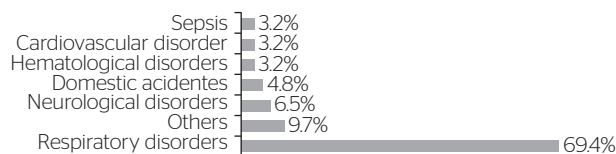


Figure 1. Distribution of the sample as to diagnostic hypothesis (n=62). Goiânia, Goiás, 2012

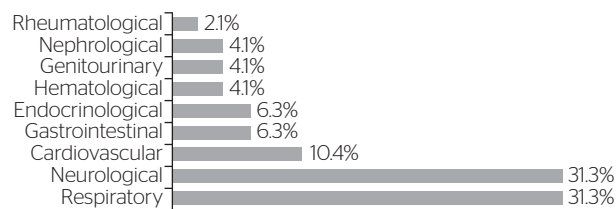


Figure 2. Distribution of the sample as to history of pathologies (n=48). Goiânia, Goiás, 2012

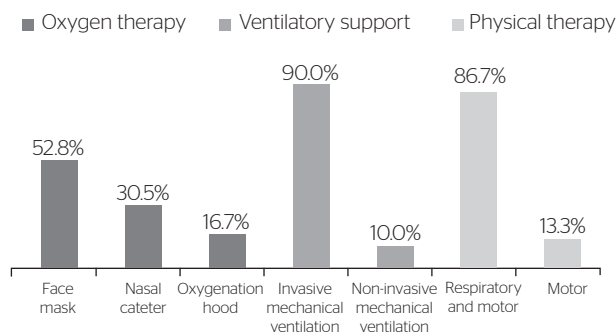
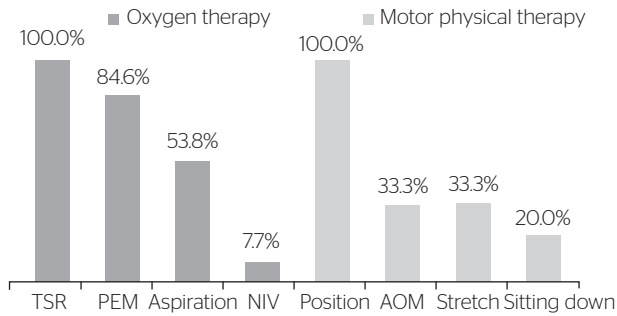


Figure 3. Distribution of the sample according to the use of oxygen therapy (n=36), ventilatory support (n=10) and physical therapy treatment (n=15), Goiânia, Goiás, 2012



TSR: techniques of secretion removal; PEM: pulmonary expansion maneuvers; NIV: non-invasive ventilation; Position: functional position; AOM: amplitude of movement; Stretch: muscle stretching

Figure 4. Distribution of the sample as to respiratory physical therapy (n=13) and motor physical therapy intervention (n=15) in the Pediatric Urgency Reference Service (SERUPE), Goiânia, Goiás, 2012

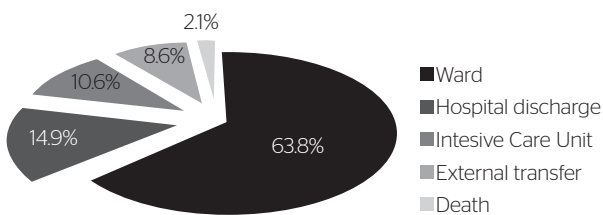


Figure 5. Distribution of the sample as to the outcome in the resuscitation room at the Pediatric Urgency Reference Service (SERUPE) (n=47), Goiânia, Goiás, 2012

DISCUSSION

Patients admitted to SERUPE were mostly from the male gender (53.2%), which is the same percentage as the one found in a study conducted by Caldeira et al.⁸

Ricetto et al.⁹ identified that infants and preschoolers are more prone to severe conditions that may lead to hospital admission, such as in this study, in which 59.2% of the participants were younger than 5 years old, and, therefore, were in the same age group as the one in the previously mentioned study.

Some studies show that the most frequent condition in emergency units composes chapter XIX of ICD 10: "Injury, poisoning and certain other consequences of external causes"¹⁰. However, Ricetto et al.⁹ described the sample of patients assisted at the pediatric emergency room of a university hospital and realized that the most frequent diagnosis was respiratory insufficiency (31.1%), corroborating the result of this study, which observed respiratory diseases as the most frequent diagnostic hypothesis (69.4%).

Respiratory conditions are very common, and also the main cause of death among children younger than five years old¹¹. In Brazil, respiratory diseases are responsible for approximately 10% of deaths among

infants younger than one year old, being the second cause of death in the population aged from zero to one year old, and the first cause of death among children aged one to four years old¹². Besides, there is great concern in relation to children with acute respiratory insufficiency, once they can rapidly progress to respiratory failure and, afterwards, cardiac arrest¹³, due to physiological characteristics.

Among the patients assisted in the resuscitation room in SERUPE, 74.5% presented with previous diseases. Such prevalence is much higher than what has been reported by Ricetto et al.⁹, who studied children from the pediatric emergency of a university hospital in the countryside of São Paulo, and found 35.0% of the patients with previous diseases.

According to Foronda¹⁴, acute respiratory insufficiency during childhood should be diagnosed early, and the fast reestablishment of oxygenation and proper ventilation is essential for its good evolution.

In this study, it was observed that 76.6% of the assessed patients needed oxygen therapy (52.8%, with a face mask). A similar result was described by Camargo et al.¹⁵, when 64.0% of the patients with respiratory conditions admitted to the pediatric ward of a university hospital underwent oxygen therapy, however, mainly administered with a nasal catheter (94.0%). The choice of oxygen therapy administration depends mainly on the efficiency of the system to be used¹⁶. Therefore, the divergence between the studies can be explained by the need to use a higher concentration of oxygen on patients with severe conditions who arrive to the emergency service; in this case, oxygen therapy is conducted with a face mask. Comparatively, patients admitted to wards are already stable, so, they require lower concentrations of oxygen, and in this case the nasal catheter is chosen.

Out of the total number of patients in this study, 19.1% needed orotracheal intubation and invasive ventilator support, similarly to what has been described by Ricetto et al.⁹, who observed that 24.6% of the patients analyzed in their study needed intubation in the pediatric emergency room. This significant need for invasive procedures (orotracheal intubation) reinforces the importance of adequate equipment and specialized professionals.

An important tool to treat patients with acute respiratory insufficiency is the use of IMV¹⁷; however, such use is not common in emergency rooms¹⁸. In this study, it was observed that among the patients who required ventilator support, only a few underwent IMV.

Out of the total number of assessed patients, 31.9% underwent physical therapy care. No other studies were found to compare the frequency of physical therapy care in pediatric emergency services.

Among the patients who were not submitted to physical therapy care, the most frequent diagnosis was asthmatic crisis (34.4%).

Asthma is one of the most common chronic conditions affecting both the children and adults, consisting of a global health problem¹⁹. Dealing with asthma exacerbation should be based on the clinical picture, considering the treatment with administration of oxygen therapy, short-acting bronchodilators and corticosteroids²⁰.

Literature is controversial when it comes to inducing bronchospasm after the application of conventional respiratory physical therapy techniques²¹. During an asthmatic crisis, there is the retention of pulmonary air, and complications such as spontaneous pneumothorax and pneumomediastinum can occur, and such conditions can be aggravated by physical therapy maneuvers²². So, patients admitted to the resuscitation room in SERUP with acute asthma crisis did not undergo physical therapy intervention, but they were followed-up and, after that stage, they received physical therapy care when necessary.

It was observed that the respiratory approach was used with most patients who underwent physical therapy intervention. Respiratory physical therapy can be used for critical patients, with the objective of preventing and/or treating pulmonary complications²³.

In this study, all of the patients who were submitted to respiratory physical therapy were also submitted to therapies for secretion removal, which are essential for the treatment of one of the most common diagnoses, pneumonia, once these procedures are indicated for clinical situations that progress with airway obstruction due to secretion and acute respiratory insufficiency^{24,25}.

Pulmonary expansion maneuvers have also been widely used in this study, consisting of a variety of techniques and resources that aim to increment pulmonary volumes by increasing the transpulmonary pressure gradient, be it by reducing pleural pressure or by increasing intra-alveolar pressure, with the consequent optimization of gas exchange and the decrease in respiratory effort²⁶.

All of the patients who underwent physical therapy intervention were properly placed on the bed, which was a recommendation by França et al.²⁷. The adequate position and mobilization are part of the physical therapy care, and they should always be associated

with other resources²⁷ in order to enable better biomechanical conditions, the stimulation of the neuromusculoskeletal system and the optimization of the respiratory function^{28,29}.

Out of the participants, 53.8% remained in the ward and 10.6% went to the ICU, and this result is opposite to the one found by Riccetto et al.⁹, who described a narrow relationship between the pediatric emergency room and the pediatric ICU of a university hospital in São Paulo, in which 42.4% of the patients were referred to the ICU. It is worth to mention that the state of Goiás is going through a crisis in public health, and the number of pediatric ICU beds is insufficient to meet the needs of the population.

Even if the resuscitation room of SERUPE is not an appropriate place nor is it adequate for the treatment of children who require more complex attention, the resoluteness of the provided service was observed, which can be confirmed by the low mortality rate in this study.

It is also important to mention that the multi-professional from SERUPE, in HC/UFG, does not count on a physical therapist. Professionals who participated in the study belong to the Program of Multiprofessional Residency in Health, in the Urgency and Emergency department.

CONCLUSION

In the studied group, male children were prevalent, with mean age of 5.2 ± 4.1 years old, whose main complaint was dyspnea and diagnostic hypothesis of respiratory conditions. Most of them had previous pathologies, and respiratory and neurological diseases were the most common ones.

A great part of the patients underwent oxygen therapy, and there was the need for an invasive procedure for ventilator support in 19.1% of the cases. In general, patients remained in the resuscitation room for less than 48 hours, and most of them were referred to subsequent admission to wards.

About one third of the patients (31.9%) received physical therapy care in the resuscitation room, and most of them with motor and respiratory approaches. The insertion of a physical therapist in urgency and emergency units has been increasing, and there are few studies involving this new field of work. Therefore, we propose studies that assess the impact of this work in this sector.

REFERENCES

- Kovacs MH, Feliciano KVO, Sarinho SW, Veras AACA. Acessibilidade às ações básicas entre crianças atendidas em serviço de pronto-socorro. *J Pediatr (Rio J)*. 2005;81(3):251-8.
- Brasil. Ministério da Saúde. Secretaria Nacional de Organização e Desenvolvimento de Serviços de Saúde. Terminologia básica em saúde. Brasília: Centro de Documentação do Ministério da Saúde; 1987.
- Neves CAB. Urgências e emergências em saúde: perspectivas de profissionais e usuários. *Cad Saúde Pública*. 2006;22(3):691-4.
- Giglio-Jacquemot A. Urgências e emergências em saúde: perspectivas de profissionais e usuários. Rio de Janeiro: Fiocruz; 2005.
- Silva EMR, Tronchin DMR. Acolhimento de usuários em um pronto-socorro infantil na perspectiva dos enfermeiros. *Acta Paul Enferm*. 2011;24(6):799-803.
- Alves M, Ramos FRS, Penna CMM. O trabalho interdisciplinar: aproximações possíveis na visão de enfermeiras de uma unidade de emergência. *Texto & Contexto Enferm*. 2005;14(3):323-31.
- Altheman F. Transformar. *Rev CREFITO*. 2007;3:24-5.
- Caldeira T, Santos G, Pontes E, Dourado R, Rodrigues L. O dia-a-dia de uma urgência pediátrica. *Acta Pediatr Port*. 2006;1(37):1-4.
- Ricetto AGL, Zambon MP, Marmo DB, Brandão MB, Queiroz RA, Reis MC, et al. Sala de emergência em pediatria: casuística de um hospital universitário. *Rev Paul Pediatr*. 2007;25(2):156-60.
- Simons DA, Monlleó IL, Simons SA, Araújo Júnior JL. Adequação da demanda de crianças e adolescentes atendidos na unidade de emergência em Maceió, Alagoas, Brasil. *Rev Bras Saúde Mater Infant*. 2010;10(1):59-67.
- Faria LS. Insuficiência Respiratória Aguda. In: Schwartsman CR, Gorete A, Farhat SCLS. Pronto-Socorro. Coleção Pediatria do Instituto da Criança HC-FMUSP. São Paulo: Manole; 2009. p. 225-36.
- Sigaud CHS. Concepções e práticas maternas relacionadas à criança com pneumonia: estudo realizado no município de São Paulo [Tese]. São Paulo: Faculdade de Saúde Pública, Universidade de São Paulo; 2003.
- Zideman D, Hazinski M. Background and epidemiology of pediatric cardiac arrest. *Pediatr Clin North Am*. 2008;55(4):847-59.
- Foronda FAK. Insuficiência respiratória aguda na criança - avaliação diagnóstica. *Pneumologia Paulista*. 2009;22(6):5-11.
- Camargo PAB, Pinheiro AT, Hercos ACR, Ferrari GF. Oxigenoterapia inalatória em pacientes pediátricos internados em hospital universitário. *Rev Paul Pediatr*. 2008;26(1):43-7.
- Troster EJ, Faria LS. Insuficiência respiratória aguda. In: Marcondes E, Vaz FA, Ramos JL, Okay Y, editores. *Pediatria básica*. 9ª ed. São Paulo: Sarvier; 2003. Tomo II. p. 452-60.
- Chiavegato LD, Rodrigues RG, Civile VT. Ventilação não invasiva (VNI) na sala de emergência - indicações e evidências. *Pneumologia Paulista*. 2009;22(6):22-5.
- Cross AM. Review of the role of non-invasive ventilation in the emergency department. *J Accid Emerg Med*. 2000;17(2):79-85.
- Global Initiative for Asthma - GINA [Internet]. Bethesda: Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, 2010 [acesso 09 jan. 2013]. Disponível em: http://www.ginasthma.org/pdf/GINA_Report_2010.pdf
- Diretrizes da Sociedade Brasileira de Pneumologia e Tisiologia para o Manejo da Asma - 2012. *J Bras Pneumol*. 2012;38(1):1-46.
- Barnabé V, Saraiva B, Stelmach B, Martins MA, Patrocínio M. Chest physiotherapy does not induce bronchospasm in stable asthma. *Physiotherapy*. 2003;89:714-9.
- Holloway E, Ram FS. Breathing exercises for asthma. *Cochrane Database Syst Rev*. 2004;(1):CD001277.
- Ogawa KYL, Frigeri LB, Diniz JS, Ferreira CAS. Intervenção fisioterapêutica nas emergências cardiopulmonares. *Mundo Saúde*. 2009;33(4):457-66.
- Almeida CC, Ribeiro JD, Almeida-Júnior AA, Zeferino AM. Effect of expiratory flow increase technique on pulmonary function of infants on mechanical ventilation. *Physiother Res Int*. 2005;10(4):213-21.
- Bernard-Narbonne F, Daoud P, Castaing H, Rousset A. Effectiveness of chest physiotherapy in ventilated children with acute bronchiolitis. *Arch Pediatr*. 2003;10(12):1043-7.
- Unoki T, Mizutani T, Toyooka H. Effects of expiratory rib cage compression and/or prone position on oxygenation and ventilation in mechanically ventilated rabbits with induced atelectasis. *Respir Care*. 2003;48(8):754-62.
- França EET, Ferrari F, Fernandes P, Cavalcanti R, Duarte A, Martinez BP, et al. Fisioterapia em pacientes críticos adultos: recomendações do departamento de fisioterapia da Associação de Medicina Intensiva Brasileira. *Rev Bras Ter Intensiva*. 2012;24(1):6-22.
- Nicolau CM, Lahóz AL. Fisioterapia respiratória em terapia intensiva pediátrica e neonatal: uma revisão baseada em evidências. *Pediatria (São Paulo)*. 2007;29(3):216-21.
- Clini E, Ambrosino N. Early physiotherapy in the respiratory intensive care unit. *Respir Med*. 2005;99(9):1096-104.