BMJ Paediatrics Open

BMJ Paediatrics Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Paediatrics Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjpaedsopen.bmj.com).

If you have any questions on BMJ Paediatrics Open's open peer review process please email info.bmjpo@bmj.com

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

BMJ Paediatrics Open

Reliability of the ReSVinet scale for parents and health care workers in a pediatric emergency service

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000966
Article Type:	Original research
Date Submitted by the Author:	28-Nov-2020
Complete List of Authors:	Camacho Cruz, Jhon; Fundacion Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Briñez, Shirley ; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Alvarez, Jorge; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Leal, Victoria; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Villamizar Gómez , Licet; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Vasquez-Hoyos, Pablo; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José
Keywords:	Health services research

SCHOLARONE™
Manuscripts

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

Reliability of the ReSVinet scale for parents and health care workers in a pediatric emergency service

Short title: ReSVinet scale in a pediatric emergency setting.

Funding Source: None stated by the authors.

Financial Disclosure: All authors have indicated they have no financial relationships relevant to this article to disclose.

Conflict of interest: The authors have indicated they have no potential conflicts of interest to disclose.

Abbreviations:
ARI: Acute respiratory infection
HCW: Health Care Workers
RSV: Respiratory syncytial virus

What's Known: Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. The absence of a universally available scale to enable parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation.

What This Study Adds: This study shows that ReSVinet scale a overall substantial reliability when used by Health Care Workers (HCW), but when used by HCW compared to when used by parents in the pediatric emergency setting.

Acknowledgements
We wish to thank Doctor Antonio Justicia-Grande for his support.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Contributors
JHC and LVG conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. SB, JA, VL and PVH designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. All authors conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content. All authors too approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Reliability of the ReSVinet scale for parents and health care workers in a pediatric emergency service

Abstract

Introduction. Most scales for acute respiratory infection (ARI) are limited to Health Care Worker (HCW) use for clinical decision-making. ReSVinet offers a version for parents that could potentially help as an early warning system.

Objective. To determine whether or not the ReSVinet scale for acute respiratory infection in infants is reliably used by HCW and parents at an emergency service.

Methods. A prospective study was done of infants with ARI who were admitted to a pediatric emergency room to assess the reliability of the ReSVinet scale when used by faculty, residents, and parents. The Spearman correlation and a weighted Kappa coefficient were used to measure inter-observer agreement. The internal consistency was also tested by Cronbach's alpha test.

Results. Overall, 188 patients, 58% male, were enrolled. A Spearman correlation of 0.92 for faculty and resident scoring and 0.64 for faculty or resident and parent scoring was found. The weighted Kappa coefficients were 0.78 for faculty vs. resident, 0.41 for faculty vs. parents, and 0.41 for resident vs. parents. Cronbach's alpha test was 0.66 for faculty, 0.62 residents and 0.69 parents.

Conclusion. The ReSVinet scale used in the pediatric emergency area was found to be substantially reliable when used by HCWs but when comparing scoring done by HCW with that done by parents, the agreement between them is moderate. Future studies should focus on finding ways to improve its reliability when used by parents before the scale could be used at an emergency room as an early warning system.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

INTRODUCTION

Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. Although bronchiolitis, which is caused by the respiratory syncytial virus (RSV) occurs the most frequently (80%) (1), there are many respiratory syndromes that affect different areas of the respiratory tract involved and ranging from mild upper airway to severe and complicated lower airway diseases (2). There are multiple etiological factors in this group, most of them viral (3) although bacteria and fungi can also cause ARI. Diagnosis is based on the clinical findings, hence the importance of being well-informed on the signs and symptoms of the different respiratory diseases affecting children under 2 years of age in order to reduce mortality through accurate diagnosis and early intervention (4-6).

Every year 2.2 million children worldwide die from ARI. Reducing mortality in children under 5 years of age to less than 25 for every 1000 live births is one of the sustainable development goals for 2030 (2). Mortality in children under 5 has dropped from 12.7 million in 1990 to 5.6 million in 2016 as a result of advances achieved over the past 25 years (7-8). However, this reduction still falls short of the millennium goals. ARI are among the primary causes of disease in infants, and local beliefs regarding the different diseases and the use of home remedies or over-the-counter medications may delay care, thus increasing disease-related complications (8-11).

To date many scales have been developed to measure ARI severity. When they are constructed, respiratory rate is the most frequent item used (81%), followed by the presence

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

of abnormal breathing sounds (78%) (12), which is the basis for most of these scales designed for healthcare workers (HCW) (13). The absence of a universally available scales for parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation (13, 14). A tool that can be used by parents or non-medical personnel to assess ARI severity needs to be validated (12, 15).

The ReSVinet scale was developed by the Galician Pediatric Research Network and the FIVE research group with the collaboration of 90 pediatricians working in outpatient, inpatient, and intensive care settings. The scale is designed to assess global clinical severity in patients with ARI and may be used with ambulatory and hospitalized patients without the need for direct medical assessment. The scale can be used by HCW with information derived from medical records and by non-medical personnel (parents) by providing them with a simple tool for determining the severity of their child's condition (15). It consists of the following seven parameters: a) feeding intolerance, b) medical intervention, c) respiratory difficulty, d) respiratory frequency, e) apnea, f) general condition, and g) fever. The various parameters are assigned point values from 0 to 3 except for fever (0 to 2) which result in a total potential score of 20 points (15). The scale was validated by testing it on hospitalized children in three hospitals in Spain, but it has never been applied in a pediatric emergency room. The main objective of this study is to determine if the ReSVinet scale for assessing ARI severity in infants admitted to emergency at a general hospital in Bogotá, Colombia is reliable when used by HCW and parents.

MATERIALS AND METHODS

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

An observational, descriptive cohort study was done of patients under 2 years of age admitted to the emergency room at our general hospital in Bogotá, Colombia that provides medical services for workers with mandatory insurance. The study included patients presenting signs and symptoms of any type of ARI (rhinopharyngitis, croup, bronchiolitis, wheezing episodes, or pneumonia). Parents who wished to participate by completing the scale were included. The study was done between late November 2017 and May 2018 (high season for respiratory diseases). Patients were only approached if the parents spoke Spanish and did not have significant comorbidities, e.g., heart disease, chronic lung disease, anatomical lung malformation, neurological diseases, severe malnutrition, any immune deficiency or cancer. The authors of the scale gave us authorization and provided the original version in Spanish. The language and content of the scale were reviewed by all attending physicians in our pediatric department who determined the suitability for Colombian clinicians and parents. Ten parents were tested on their understanding of the scale and the only difficulty found was with the term apnea. Thus, a specific explanation of the term was given to parents before they filled out the scale.

Patients were identified by the treating physicians who then contacted the researchers. The scale was completed at the same time by parents, pediatric doctor-professors (hereinafter faculty), doctors specializing in pediatrics (hereinafter residents) after the parents consented to participate. Follow up on discharged patients was done by telephone on day 10 after discharge to ask about new incidents that could lead to a return visit, if they required a re-admission to another hospital, or if they were continuing treatment at home. Patients admitted to the hospital were followed until discharge or at 30 days using the clinical records to determine length of stay, need for admission to the pediatric intensive care unit (PICU), or

the use of antibiotics. All parents were contacted again by phone after 30 days in order to determine if a fatal event had occurred following the ARI. The study was approved by the institutional review board and the hospital ethics review board (Comité de Ética en Investigación en Seres Humanos – CEISH – Hospital de San José).

Statistical analysis

The following parameters were taken into consideration for sample size: type I error, 0.05; type II error, 0.20; null hypothesis test value, 0.7; and population correlation coefficient, 0.82 as described in the article by Justicia-Grande et al. (15) for a final sample size of 191 patients. A univariate analysis was done and mean or medians (p50) and standard deviations (±) or interquartile (p25-p75) were used for quantitative variables. Qualitative variables were reported in terms of percentages and absolute numbers. Total scores for faculty, resident, and parents are reported as are percentages by item for each level of severity.

For internal consistency, a Cronbach's alpha test was done in the expectation of reaching a threshold of a least 0.7. A Spearman's correlation coefficient was used to test the strength and direction of the correlations between observers. Interobserver agreement for the total scale and for each item was also calculated using weighted Kappa coefficients for groups (faculty-resident, faculty-parent, resident-parent). A value of 0.01 - 0.2 was determined to have slight, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial, and 0.81 to 1 almost perfect agreement respectively (16). Each item was also compared by categories of severity as selected by parent, faculty or resident using an Ordered logistic regression. The Stata 13 software package was used for statistical analysis as well as for the calculation of the sample size and graphics.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

RESULTS

We initially enrolled 191 patients, but when the statistical analysis was done, two cases were found that did not meet the age criteria and one was lost to initial follow up. Table 1 shows their demographic and clinical characteristics. Mean age was 10.6 ± 7.1 months, and 110 were males (58.5%). ARI diagnoses were rhinopharyngitis 40.4%, bronchiolitis 28.7%, croup 17.1%, wheezing episodes 12.2%, and pneumonia 1.6%. The average number of days between first symptoms and consultation was 5.9 ± 5.7. Of the total number of patients, 29.3% were hospitalized, 35.6% stayed for a short-term observation (less than 24 hours), and 35.1% were discharged after initial assessment. Hospital length of stay was 4.5 ± 5.1 days on average, only 2.7% were admitted to the PICU, and 4.8% received antibiotics. No deaths in this cohort were reported at the 30-day follow up call in 182 cases (96.8%). Six patients did not respond to the last follow up phone call.

Scores on the ReSVinet scale

All the observers completed the ReSVinet scale. The median total scale score was 5 (4 - 7) for faculty, 6 (4 - 7) for resident, and 6 (4 - 8) for parent. When total scores were compared, no significant differences were found (faculty vs resident p=0.66, faculty vs parent p=0.18, resident vs parent, p=0.33).

A look at Cronbach's alpha for total internal consistency of the scale revealed 0.66 for faculty, 0.62 for resident and 0.69 for parents respectively. Overall Spearman's coefficient between faculty and resident was 0.92 and 0.64 between faculty or resident and parent (figures 2, 3 and 4). The weighted kappa coefficients were then examined and substantial agreement between faculty and resident (0.78, 95 CI 0.76-0.80), moderate agreement

between faculty and parent (0.41, 95% CI 0.36-0.47), and between resident and parent, (0. 41, 95% CI 0.32-0.49) were found. Agreement for each item is shown in Table 2.

Analysis by individual items showed statistical differences between parent and either faculty or resident on medical intervention, respiratory difficulty, and frequency, $p<0.01$. For respiratory difficulty and rate, parents scored respiratory difficulty higher by choosing mild while HCW chose normal. Parents scored medical invention lower than HCW (Figure 1).

DISCUSSION

This study shows that the ReSVinet scale is highly reliable when used by HCW for assessing ARI in the pediatric emergency setting although it was lower when comparing use by parents and HCW. Substantial interobserver agreement was found between faculty and pediatric residents, but agreement between the healthcare workers and parents was moderate due to differences in scoring medical intervention, respiratory difficulty and frequency items.

Advances intended to reduce morbidity and mortality in pediatric patients have taken place around the world over the past few years. Several studies show variations in the way ARI is diagnosed and treated in the pediatric population (17). The ReSVinet was designed to determine the severity of acute lower respiratory tract infections in infants. This study included both lower and upper acute respiratory infections in the search for a more practical clinical application for infants with any significant respiratory disease. Moreover, because the study was a prospective concurrent enrollment, an attempt was made to avoid memory biases which may arise from the use of clinical records. This is the first published study using the scale based on data collected in an emergency setting.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Significant variability was found in the individual elements of the scale, particularly in medical intervention and respiratory frequency and difficulty where agreement between the parents and the HCW was found to be slight or fair. When assessing respiratory rate, measurements should ideally be taken for 60 seconds and with a calm patient. In the case of children in an emergency room, it may be difficult to assess (18). Moreover, at younger ages, it can be more complex to assess as it varies based on the patient's own conditions (fever, crying, pain, hunger, and anxiety from being in an unfamiliar environment) (19). Other studies have shown poor agreement between parents and HCW regarding detection of respiratory distress with kappa values between 0.26 and 0.36 (20). We believe another way of measuring signs of respiratory distress such as frequent reassessments (every 3 hours) may make it easier to identify an abnormal respiratory pattern. Up to 7% of patients may develop intercostal retractions during periodic monitoring (21). Finally, it may be necessary to use technical devices such as automatic respiratory rate counters, but that requires cost-effectiveness studies for its implementation (22,23). It has also been previously shown that the sensitivity and specificity that caregivers have is insufficient to recognize tachypnea and signs of respiratory distress in respiratory diseases and pneumonia (24).

On the subject of medical intervention, most parents choose no treatment in our study. When the original scale was evaluated, it was used before discharge. In our study, the parents were asked to complete the scale at the emergency room (to avoid any memory bias) right after medical evaluation was done and a course of action was defined. Three observers filled it out at the same time to ensure that they were evaluating the same conditions instead of conditions that had changed. This suggests that this scale may require more explanation or training (prior to using it) or a more specific guide that explains in greater detail how to score

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

individual points on the scale in the parents' version. Another factor to include in a study would be the best time to ask parents to fill out the scale.

Agreement regarding the item 'general condition' was fair, but there was significant variability in the score. The explanation may be that the sample used was mainly for upper respiratory infection, and parents could overestimate their scores and lose objectivity when going to the emergency room (25,26). General condition is subjective and varies between parents and medical examiners since going from home to a hospital environment may cause changes in their comfort, state of mind, (calm, irritable, scared), their well-being (normal, feverish or sick). Therefore, it will be necessary to try to standardize these conditions when examining patients. It has been shown that there is a growing tendency to visit pediatric emergency rooms for reasons such as perceived severity of symptoms, the availability of continuous care that allows for assessment within a short period of time, and the perceived benefit of having been assessed by a pediatrician (11,27).

There was better agreement regarding feeding intolerance, and fever showed an almost perfect agreement. This is because both are easy to measure objectively since they are quite clear on the scale for parental use, thermometers are widely available in our environment, and even the detection of fever by palpation has showed suitable sensitivity – 88% (95% CI 79% - 93%) (28, 29).

Cronbach's alpha was low. These findings may be the result of assessing different respiratory diagnoses. Since the initial design was only for bronchiolitis, the result may be lower when various diseases with different symptoms are assessed. A universal scale for all ARIs is, in our opinion, a far better option than individual scales for each respiratory disease.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Regarding the lower agreement with parents, several variables may explain these findings: a) parents' expectations from the point of view of the healthcare setting where patients were recruited (the original study was done with hospitalized patients (15) while this study was done in the emergency room); b) the higher percentage of rhinopharyngitis in this study vs bronchiolitis in the original study (10); and c) Bogota's high altitude (2600 meters above sea level) can change the perception of symptoms, but this has not been carefully studied (30, 31).

One limitation in the study is that only three patients were diagnosed with pneumonia. Pneumonia is a leading cause of death in developing countries. Therefore, it is relevant to have a representative sample of this condition. Another limitation is that patients requiring in-hospital management for reasons other than the respiratory condition (patients with gastroenteritis and food intolerance) were not excluded. This could lead to an overestimate of the risk of hospitalization for patients with conditions like rhinopharyngitis who are normally not hospitalized on that account. However, given that the frequency of this condition was rare, the impact on the results was low. Involvement of other systems should be taken into consideration as part of the exclusion criteria in future studies.

If avoidable deaths in infants are to be reduced, improved access to healthcare services must be a priority (23). The results of this study give rise to new hypotheses for studies designed to validate individual elements of the ReSVinet scale that may be easy for parents to complete. Additional studies involving lower respiratory tract infections are also needed.

CONCLUSION

The ReSVinet scale was found to have substantial reliability when used by HCW in the pediatric emergency area to assess ARI. In our population, agreement between scoring by HCW and that done by parents was moderate, and slight agreement was found for medical intervention and respiratory rate. This tool was used for the first time in the pediatric emergency room, and it has been shown to be promising and reliable when used by healthcare personnel to assess the severity of acute respiratory infection in children under 2 years of age. Future studies should focus on finding ways to enable parents to use it reliability for two individual items so that it can be used in the emergency room.

REFERENCES

1. Piedimonte G, Perez MK. Respiratory syncytial virus infection and bronchiolitis. Pediatr Rev. 2014;35(12):519-30.

2. Collaborators GS. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):2091-138.

3. Rodríguez-Martínez CE, Rodríguez DA, Nino G. Respiratory syncytial virus, adenoviruses, and mixed acute lower respiratory infections in children in a developing country. J Med Virol. 2015;87(5):774-81.

4. Bordley WC, Viswanathan M, King VJ, Sutton SF, Jackman AM, Sterling L, et al. Diagnosis and testing in bronchiolitis: a systematic review. Arch Pediatr Adolesc Med. 2004;158(2):119-26.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

5. Doan Q, Enarson P, Kissoon N, Klassen TP, Johnson DW. Rapid viral diagnosis for acute febrile respiratory illness in children in the Emergency Department. Cochrane Database Syst Rev. 2014(9):CD006452.

6. Ralston SL, Lieberthal AS, Meissner HC, Alverson BK, Baley JE, Gadomski AM, et al. Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis. Pediatrics. 2014;134(5):e1474.

7. Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT. Child and Adolescent Health and Development: Realizing Neglected Potential. In: Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT, editors. Child and Adolescent Health and Development. 3rd ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017.

8. Rashid SF, Hadi A, Afsana K, Begum SA. Acute respiratory infections in rural Bangladesh: cultural understandings, practices and the role of mothers and community health volunteers. Trop Med Int Health. 2001;6(4):249-55.

9. Hildenwall H, Rutebemberwa E, Nsabagasani X, Pariyo G, Tomson G, Peterson S. Local illness concepts--implications for management of childhood pneumonia in eastern Uganda. Acta Trop. 2007;101(3):217-24.

10. Bham SQ, Saeed F, Shah MA. Knowledge, Attitude and Practice of mothers on acute respiratory infection in children under five years. Pak J Med Sci. 2016;32(6):1557-61.

11. Kua PH, Wu L, Ong EL, Lim ZY, Yiew JL, Thia XH, et al. Understanding decisions leading to nonurgent visits to the paediatric emergency department: caregivers' perspectives. Singapore Med J. 2016;57(6):314-9.

12. Rodriguez-Martinez CE, Sossa-Briceño MP, Nino G. Systematic review of instruments aimed at evaluating the severity of bronchiolitis. Paediatr Respir Rev. 2018;25:43-57.

13. Destino L, Weisgerber MC, Soung P, Bakalarski D, Yan K, Rehborg R, et al. Validity of respiratory scores in bronchiolitis. Hosp Pediatr. 2012;2(4):202-9.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

14. Bekhof J, Reimink R, Brand PL. Systematic review: insufficient validation of clinical scores for the assessment of acute dyspnoea in wheezing children. Paediatr Respir Rev. 2014;15(1):98-112.

15. Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS One. 2016;11(6):e0157665.

16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.

17. Kou M, Hwang V, Ramkellawan N. Bronchiolitis: From Practice Guideline to Clinical Practice. Emerg Med Clin North Am. 2018;36(2):275-86.

18. Muro F, Mtove G, Mosha N, et al. Effect of context on respiratory rate measurement in identifying non-severe pneumonia in African children. Trop Med Int Health. 2015;20(6):757-765

19. Simoes EA, Roark R, Berman S, Esler LL, Murphy J. Respiratory rate: measurement of variability over time and accuracy at different counting periods. Arch Dis Child. 1991;66(10):1199-1203

20. Kahigwa E, Schellenberg D, Schellenberg JA, Aponte JJ, Alonso PL, Menendez C. Inter-observer variation in the assessment of clinical signs in sick Tanzanian children. Trans R Soc Trop Med Hyg 2002: 96: 162–166.

21. Lenahan JL, Nkwopara E, Phiri M, Mvalo T, Couasnon MT, Turner K, et al. Repeat assessment of examination signs among children in Malawi with fast-breathing pneumonia. ERJ Open Res. 2020;6(2):00275-2019

22. Källander K, Ward C, Smith H, Bhattarai R, Kc A, Timsina D et al. Usability and acceptability of an automated respiratory rate counter to assess childhood pneumonia in Nepal. Acta Paediatr. 2020;109(6):1207-1220

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

23 Ward C, Baker K, Marks S, Getachew D, Habte T, McWhorter C et al. Determining the Agreement Between an Automated Respiratory Rate Counter and a Reference Standard for Detecting Symptoms of Pneumonia in Children: Protocol for a Cross-Sectional Study in Ethiopia. JMIR Res Protoc. 2020;9(4):e16531

24. Geldsetzer P, Williams TC, Kirolos A, Mitchell S, Ratcliffe LA, Kohli-Lynch MK, et al. The recognition of and care seeking behaviour for childhood illness in developing countries: a systematic review. PLoS One. 2014;9(4):e93427.

25. Feudtner C, Walter JK, Faerber JA, Hill DL, Carroll KW, Mollen CJ, et al. Good-Parent beliefs of Parents of seriously ill children. JAMA Pediatr. 2015;169(1):39-47.

26. Kubicek K, Liu D, Beaudin C, Supan J, Weiss G, Lu Y, et al. A profile of nonurgent emergency department use in an urban pediatric hospital. Pediatr Emerg Care. 2012;28(10):977-84.

27. Muhe L. Mothers' perceptions of signs and symptoms of acute respiratory infections in their children and their assessment of severity in an urban community of Ethiopia. Ann Trop Paediatr. 1996;16(2):129-35.

28. Hutter D. "Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?". Paeditrica. 2006;17(1):49-51.

29. Muro F, Meta J, Renju J, Mushi A, Mbakilwa H, Olomi R, et al. "It is good to take her early to the doctor" - mothers' understanding of childhood pneumonia symptoms and health care seeking in Kilimanjaro region, Tanzania. BMC Int Health Hum Rights. 2017;17(1):27.

30. Hutter D. "Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?". Paeditrica. 2006;17(1):49-51.

31. Muro F, Meta J, Renju J, Mushi A, Mbakilwa H, Olomi R, et al. "It is good to take her early to the doctor" - mothers' understanding of childhood pneumonia symptoms and health care seeking in Kilimanjaro region, Tanzania. BMC Int Health Hum Rights. 2017;17(1):27.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 1. Clinical and demographic characteristics

VARIABLE	**Total n=188**
	n (%)
Age in months, mean ± SD	10. 6 ±7. 1
0-3 months	40 (21. 3)
4-12	66 (35.1)
>12 months	82 (43.6)
Gender, male	110 (58.5)
Diagnosis	
Rhinopharyngitis	76 (40.4)
Bronchiolitis	54 (28.7)
Croup	32 (17.1)
Wheezing	23 (12.2)
Pneumonia	3 (1.6)
Time from first symptoms, mean ± SD	5.9 ±5. 7
1 to 7 days	143 (76)
8 to 14 days	24 (12. 8)
15 to 30 days	21 (11. 2)
Treatment decision	
Discharged	66 (35.1)
Short-term Observation (< 24 hours)	67 (35.6)
Hospital admission	55 (29. 3)
Viral isolation tested	58 (30.8)
Negative	35 (18.6)
RSV	17 (9)
Adenovirus	3 (1.6)
Parainfluenza 1	2 (1.1)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Adenovirus and RSV	1 (0.5)
Mean length of stay in days ± SD	4.5±5
0 to 7 days	178 (94. 7)
8 to14 days	8 (4. 3)
15 to 30 days	2 (1)
Antibiotic prescribed	9 (4. 8)
PICU admission	5 (2. 7)
30-day mortality, n= 182	0
Return visit before 10 days	25(13.3)
Discharged	10 (5. 3)
Short-term Observation (<24 hours)	15 (7.9)
Hospital admission	0

SD: standard deviation; n: absolute number or decimal. % percentage; RSV: respiratory syncytial virus; PICU: Pediatric intensive care unit.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 2. Interobserver agreement for each item on the scale (weighted Kappa coefficient)

Item	Faculty vs Resident (95% IC)	Faculty vs Parent (95% IC)	Resident vs Parent (95% IC)
Feeding intolerance	0. 72 (0.64 – 0.77) Substantial	0.45 (0.42 – 0.49) Moderate	0.44 (0.35 – 0.46) Moderate
Medical intervention	0.88 (0.82 – 0.89) Almost perfect	0.07 (0.00 -0.12) Slight	0.26 (0.23 – 0.32) Fair
Respiratory difficulty	0.76 (0.73 – 0.85) Substantial	0.28 (0.22-0.36) Fair	0.26 (0.23 – 0.35) Fair
Respiratory frequency	0.86 (0.74 – 0.91) Almost perfect	0.08 (0.02 – 0.13) Slight	0.08 (0.05 – 0.17) Slight
Apnea	*	*	*
General condition	0.76 (0.71 – 0.82) Substantial	0.25 (0.25 – 0.30) Fair	0.34 (0.28 – 0.37) Fair
Fever	0.99 (0.99 – 1) Almost perfect	0.82 (0.74 – 0.88) Almost perfect	0.82 (0.78 – 0.87) Almost perfect
TOTAL	0.78 (0.76 – 0.80) Substantial	0.41 (0.36 – 0.47) Moderate	0.41 (0.32 – 0.49) Moderate

* Was not scored due to non-occurrence of symptom within observation period of the Faculty or Resident group.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 1. ReSVinet scale percentage by item

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 2. Scatter and Fitted Plot of ReSVinet score: faculty vs. parent

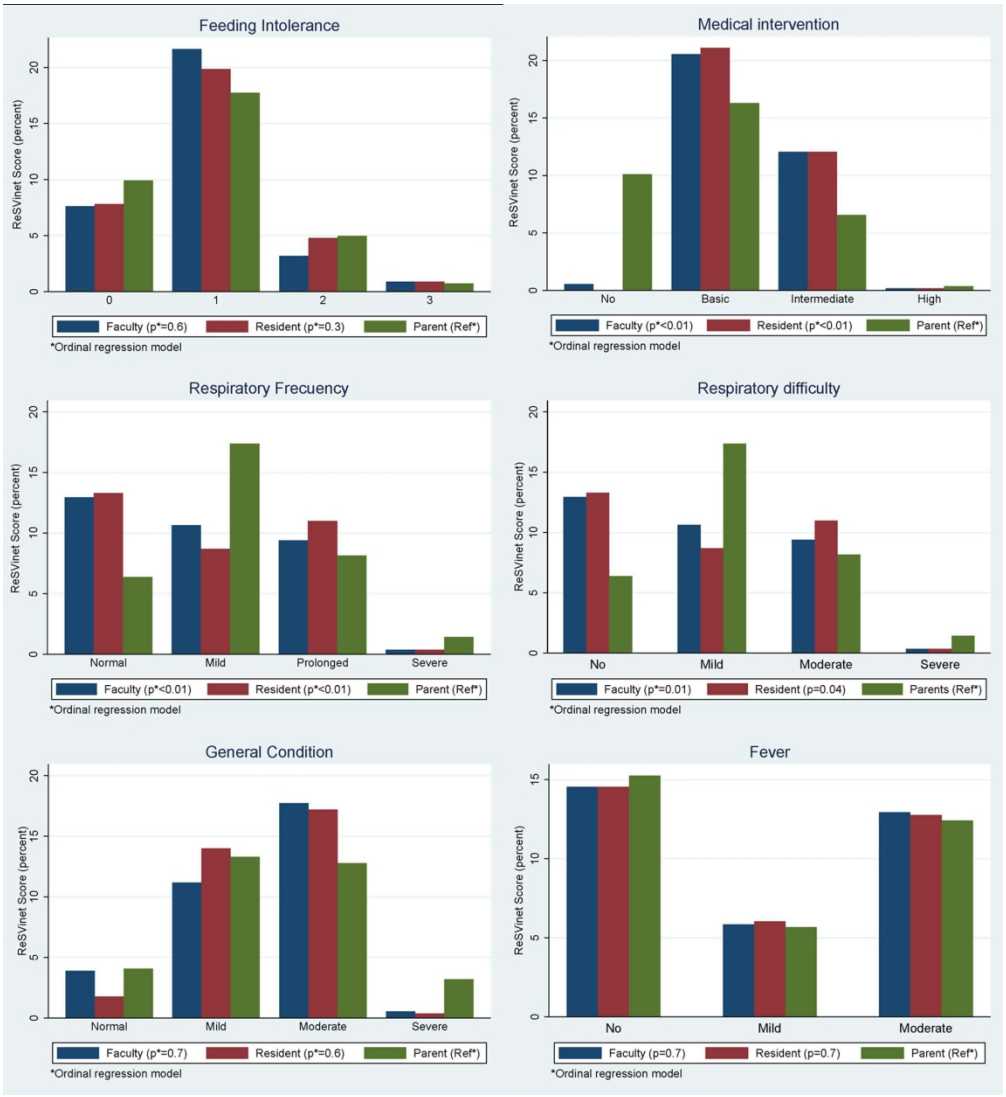
bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 3. Scatter and Fitted Plot of ReSVinet score: resident vs. parent

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

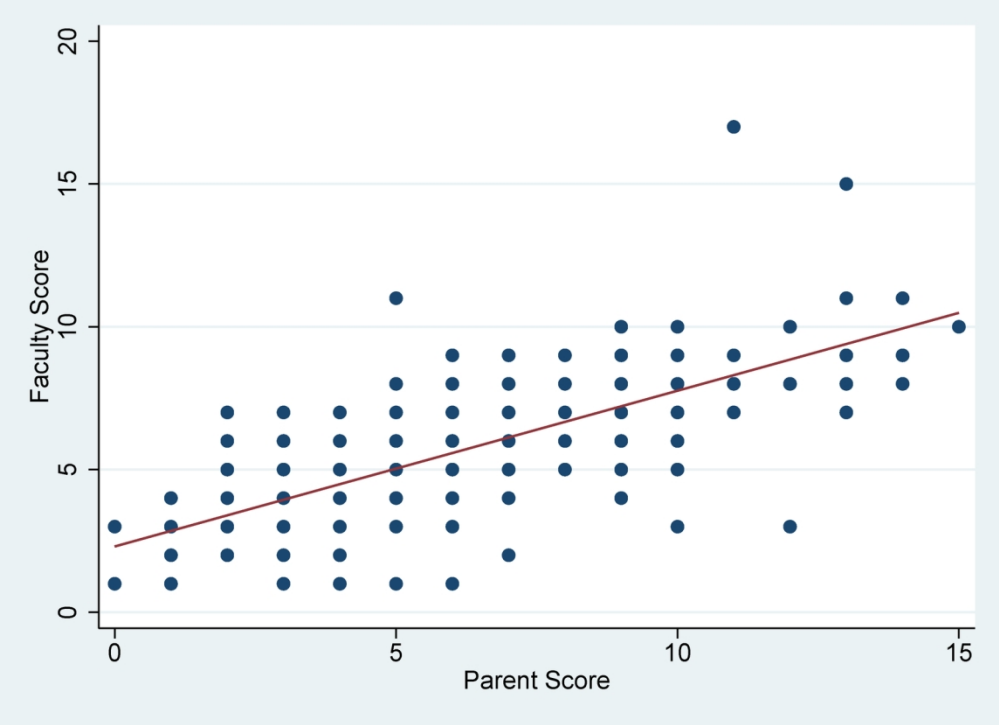
Figure 4. Scatter and Fitted Plot of ReSVinet score: faculty vs. resident

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



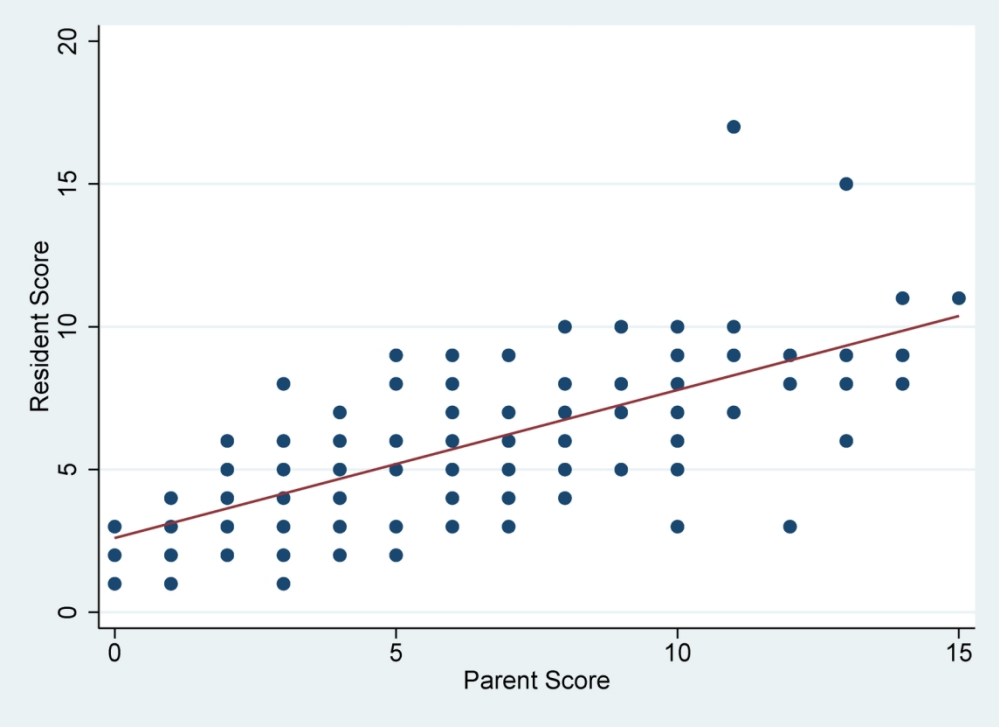
2117x2309mm (72 x 72 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



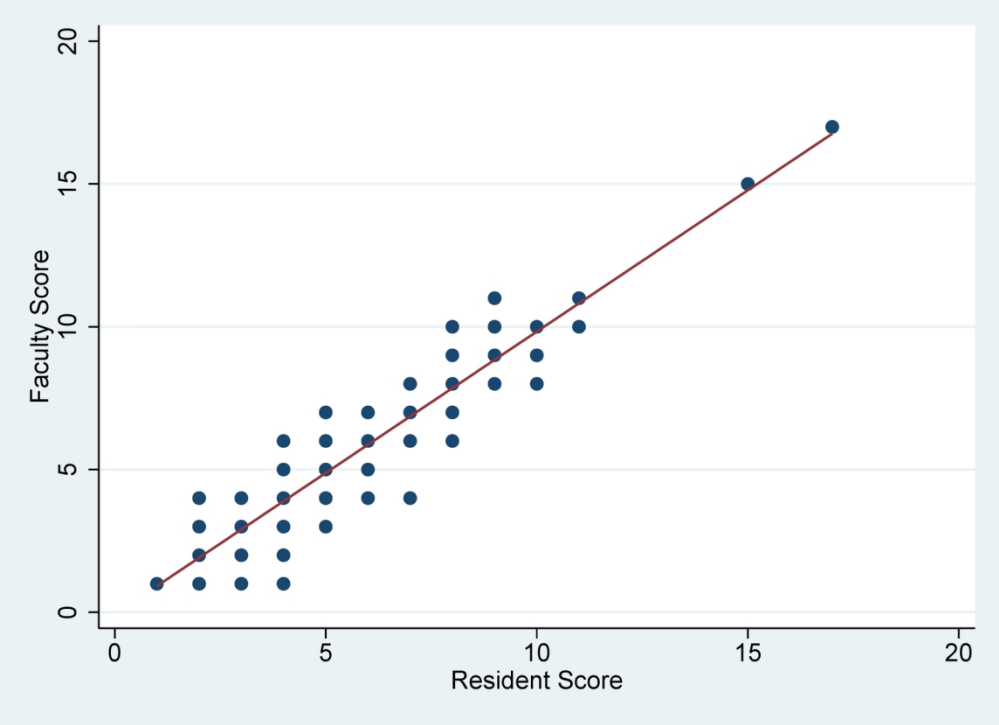
139x101mm (300 x 300 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (300 x 300 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (300 x 300 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

BMJ Paediatrics Open

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000966.R1
Article Type:	Original research
Date Submitted by the Author:	17-Feb-2021
Complete List of Authors:	Camacho-Cruz, Jhon; Fundacion Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Briñez, Shirley ; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Alvarez, Jorge; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Leal, Victoria; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Villamizar Gómez , Licet; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José Vasquez-Hoyos, Pablo; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José
Keywords:	Health services research

SCHOLARONE™
Manuscripts

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Corresponding author: Dr Jhon Camacho-Cruz, Associate Instructor, Department of Pediatrics, Fundación Universitaria de Ciencias de la Salud (FUCS), Cra 19 No. 8A – 32, Bogotá, Colombia. jhcamacho@fucsalud.edu.co

Co-authors: Camacho-Cruz Jhon[a], Briñez Shirley[a], Álvarez Jorge[a], Leal Victoria[a], Villamizar Gómez Licet[b], Vasquez-Hoyos Pablo[a]

Affiliations: [a]Department of Pediatrics. Fundación Universitaria de Ciencias de la Salud, Hospital de San José, and[b] Research Division. Fundación Universitaria de Ciencias de la Salud, Hospital de San José Bogotá, Colombia.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

Word count: 2771

Reference count: 29

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Short title: ReSVinet scale in a pediatric emergency setting.

Funding Source: None stated by the authors.

Financial Disclosure: All authors have indicated they have no financial relationships relevant to this article to disclose.

Conflict of interest: The authors have indicated they have no potential conflicts of interest to disclose.

Abbreviations:
ARI: Acute respiratory infection
HCW: Health Care Workers
RSV: Respiratory syncytial virus

What's Known: Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. The absence of a universally available scale to enable parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation.

What This Study Adds: There was good correlation of scores between health professionals. There was more variation between scores by parents and health professional.

Acknowledgements
We wish to thank Doctor Antonio Justicia-Grande for his support.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Contributors
JHC and LVG conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. SB, JA, VL and PVH designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. All authors conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content. All authors also approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Abstract

Introduction. Most scales for acute respiratory infection (ARI) are limited to Health Care Worker (HCW) use for clinical decision-making. The Respiratory Syncytial Virus network (ReSVinet) scale offers a version for parents that could potentially help as an early warning system.

Objective. To determine whether or not the ReSVinet scale for acute respiratory infection in infants is reliably used by HCW and parents at an emergency service.

Methods. A prospective study was done of infants with ARI who were admitted to a pediatric emergency room to assess the use of the ReSVinet scale when used by faculty (pediatric doctor-professors), residents (doctors doing their first specialty in pediatrics), and parents. The Spearman correlation and a weighted Kappa coefficient were used to measure inter-observer agreement. The internal consistency was also tested by Cronbach's alpha test.

Results. Overall, 188 patients, 58% male, were enrolled. A Spearman correlation of 0.92 for faculty and resident scoring and 0.64 for faculty or resident and parent scoring was found. The weighted Kappa coefficients were 0.78 for faculty vs. resident, 0.41 for faculty vs. parents, and 0.41 for resident vs. parents. Cronbach's alpha test was 0.67 for faculty, 0.62 for residents and 0.69 for parents.

Conclusion. There was a good correlation in ReSVinet scores by health professionals when used in the pediatric emergency area. Agreement between parents and health professionals was found to be more variable. Future studies should focus on finding ways to improve its reliability when used by parents before the scale is used in the emergency room.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

INTRODUCTION

Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. Although bronchiolitis, which is caused by the respiratory syncytial virus (RSV) occurs the most frequently (80%) (1), there are many respiratory syndromes that affect different areas of the respiratory tract involved and range from mild upper airway to severe and complicated lower airway diseases (2). There are multiple etiological factors in this group, most of them viral (3) although bacteria and fungi can also cause ARI. Diagnosis is based on the clinical findings, hence the importance of being well-informed regarding the signs and symptoms of the different respiratory diseases affecting children under 2 years of age in order to reduce mortality through accurate diagnosis and early intervention (4-6).

Every year 2.2 million children worldwide die from ARI. Reducing mortality in children under 5 years of age to less than 25 for every 1000 live births is one of the sustainable development goals for 2030 (2). Mortality in children under 5 has dropped from 12.7 million in 1990 to 5.6 million in 2016 as a result of advances achieved over the past 25 years (7-8). However, this reduction still falls short of the millennium goals. ARI is among the primary cause of disease in infants, and local beliefs regarding the different diseases and the use of home remedies or over-the-counter medications may delay care, thus increasing disease-related complications (8-11).

To date many scales have been developed to measure ARI severity. In all cases, respiratory rate is the most frequent item on them (81%), followed by the presence of abnormal breathing

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

sounds (78%) (12), which is the basis for most of these scales designed for healthcare workers (HCW) (13). The absence of a universally available scale for parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation (13, 14). A tool that can be used by parents or non-medical personnel to assess ARI severity needs to be validated (12, 15).

The Respiratory Syncytial Virus network (ReSVinet) scale was developed and submitted for evaluation by the Galician Pediatric Research Network and the FIVE research group with the collaboration of 90 pediatricians working in outpatient, inpatient, and intensive care settings (15). The scale is designed to assess global clinical severity in patients with ARI and may be used with ambulatory and hospitalized patients without the need for direct medical assessment. The scale can be used by HCW with information derived from medical records and by non-medical personnel (parents) by providing them with a simple tool for determining the severity of their child's condition (15). This tool consists of the following seven parameters: a) feeding intolerance, b) medical intervention, c) respiratory difficulty, d) respiratory frequency, e) apnea, f) general condition, and g) fever. The various parameters are assigned point values from 0 to 3 except for fever (0 to 2) which result in a total potential score of 20 points (Table 1) (15). The scale was validated by testing it on hospitalized children in three hospitals in Spain, but it has never been applied in a pediatric emergency room. The main objective of this study is to determine if the ReSVinet scale for assessing ARI severity in infants admitted to emergency at a general hospital in Bogotá, Colombia is reliable when used by HCW and parents.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

MATERIALS AND METHODS

An observational, descriptive cohort study was done of patients under 2 years of age admitted to the emergency room at our general hospital in Bogotá, Colombia that provides medical services for workers with mandatory insurance. The study included patients presenting signs and symptoms of any type of ARI (rhinopharyngitis, croup, bronchiolitis, wheezing episodes, or pneumonia). Parents were invited to participate by completing the scale were included. The study was done between late November 2017 and May 2018 (high season for respiratory diseases). Patients were only approached if the parents spoke Spanish and did not have significant comorbidities, e.g., heart disease, chronic lung disease, anatomical lung malformation, neurological diseases, severe malnutrition, any immune deficiency or cancer. The authors of the scale gave us authorization and provided the original version in Spanish. The language and content of the scale were reviewed by all attending physicians in our pediatric department who determined the suitability for Colombian clinicians and parents. Ten parents were tested on their understanding of the scale and the only difficulty found was with the term apnea. Thus, a specific explanation of the term was given to parents before they filled out the scale.

Patients were identified by the treating physicians who then contacted the researchers. The scale was completed at the same time by parents, pediatric doctor-professors (hereinafter faculty), doctors doing their first specialty in pediatrics (hereinafter residents) after the parents consented to participate. Follow up on discharged patients was done by telephone on day 10 after discharge to ask about new incidents that could lead to a return visit, if they required a re-admission to another hospital, or if they were continuing treatment at home. Patients admitted to the hospital were followed until discharge or at 30 days using the clinical

records to determine length of stay, need for admission to the pediatric intensive care unit (PICU), or the use of antibiotics. All parents were contacted again by phone after 30 days in order to determine if a fatal event had occurred following the ARI. The study was approved by the institutional review board and the hospital ethics review board (Comité de Ética en Investigación en Seres Humanos – CEISH – Hospital de San José).

Statistical analysis

The following parameters were taken into consideration for sample size: type I error, 0.05; type II error, 0.20; null hypothesis test value, 0.7; and population correlation coefficient, 0.82 as described in the article by Justicia-Grande et al. (15) for a final sample size of 191 patients. A univariate analysis was done and medians (p50) and interquartile (p25-p75) ranges were used for quantitative variables. Qualitative variables were reported in terms of percentages and absolute numbers. Total scores for faculty, residents, and parents are reported as are percentages by item for each level of severity. The comparison between total scores was done using the Mann-Whitney U test and analysis by individual items by ordinal logistic regression.

For internal consistency, a Cronbach's alpha test was done with the expectation of reaching a threshold of a least 0.7. A Spearman's correlation coefficient was used to test the strength and direction of the correlations between observers. Interobserver agreement for the total scale and for each item was also calculated using weighted Kappa coefficients for groups (faculty-resident, faculty-parent, resident-parent). A value of 0.01 - 0.2 was determined to have slight, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial, and 0.81 to 1 almost perfect agreement respectively (16). Each item was also compared by categories of

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

severity as selected by parent, faculty, or resident using an Ordered logistic regression. The Stata 13 software package was used for statistical analysis as well as for the calculation of the sample size and graphics, and Cronbach's alpha coefficients were analyzed using the R Statistical Software Package 4.0.2.

RESULTS

We initially enrolled 191 patients, but when the statistical analysis was done, two cases were found that did not meet the age criteria and one was lost to initial follow up. Table 2 shows their demographic and clinical characteristics. Median age was 10 (IQR 4.5 – 16) months, and 110 were males (58.5%). ARI diagnoses were rhinopharyngitis 40.4%, bronchiolitis 28.7%, croup 17.1%, wheezing episodes 12.2%, and pneumonia 1.6%. The average number of days between first symptoms and consultation was 5.9 ± 5.7. Of the total number of patients 29.3% were hospitalized, 35.6% stayed for a short-term observation (less than 24 hours), and 35.1% were discharged after initial assessment. Median hospital length of stay was 3 (IQR 2 – 5). Only 2.7% were admitted to the PICU and 4.8% received antibiotics. No deaths in this cohort were reported at the 30-day follow up call in 182 cases (96.8%). Six patients did not respond to the last follow up phone call.

Scores on the ReSVinet scale

All the observers completed the ReSVinet scale. The median total scale score was 5 (4 - 7) for faculty, 6 (4 - 7) for resident, and 6 (4 - 8) for parent. When total scores were compared, no significant differences were found (faculty vs resident p=0.66, faculty vs parent p=0.18, resident vs parent, p=0.33). Analysis by individual items showed statistical differences between parent and either faculty or resident on medical intervention, respiratory difficulty,

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

and frequency, p<0.01. For respiratory difficulty and rate, parents scored respiratory difficulty higher by choosing mild while HCW chose normal. Parents scored medical invention lower than HCW (Figure 1).

A look at Cronbach's alpha for total internal consistency of the scale revealed 0.67 (95% confidence interval 0.6– 0.74) for faculty, 0.62 (95% confidence interval 0.54 – 0.71) for resident and 0.69 (95% confidence interval 0.62– 0.75) for parents respectively. Overall Spearman's coefficient between faculty and resident was 0.92 (95% confidence interval 0.90– 0.95), 0.64 (95% confidence interval 0.55– 0.73) between faculty or resident and parent (Figures 2, 3 and 4). The weighted kappa coefficients were then examined and substantial agreement between faculty and resident (0.78, 95 CI 0.76-0.80), moderate agreement between faculty and parent (0.41, 95% CI 0.36-0.47), and between resident and parent, (0. 41, 95% CI 0.32-0.49) were found. Agreement for each item is shown in Table 3.

DISCUSSION

This study shows that the ReSVinet scale is highly reliable when used by HCW for assessing ARI in the pediatric emergency setting although it was lower when comparing use by parents and HCW. Substantial interobserver agreement was found between faculty and pediatric residents, but agreement between the healthcare workers and parents was moderate due to differences in scoring medical intervention, respiratory difficulty, and frequency items.

Advances intended to reduce morbidity and mortality in pediatric patients have taken place around the world over the past few years. Several studies show variations in the way ARI is diagnosed and treated in the pediatric population (17). The ReSVinet was designed to determine the severity of acute lower respiratory tract infections in infants. This study

included both lower and upper acute respiratory infections in the search for a more practical clinical application for infants with any significant respiratory disease. Moreover, because the study was a prospective concurrent enrollment, an attempt was made to avoid memory biases which may arise from the use of clinical records.

Significant variability was found in the individual elements of the scale, particularly in medical intervention and respiratory frequency and difficulty where agreement between the parents and the HCW was found to be slight or fair. When assessing respiratory rate, measurements should ideally be taken for 60 seconds and with a calm patient. In the case of children in an emergency room, this may be difficult to assess (18). Moreover, at younger ages, it can be more complex to assess as it varies based on the patient's own conditions (fever, crying, pain, hunger, and anxiety from being in an unfamiliar environment) (19). Other studies have shown poor agreement between parents and HCW regarding detection of respiratory distress with kappa values between 0.26 and 0.36 (20). We believe another way of measuring signs of respiratory distress such as frequent reassessments (every 3 hours) may make it easier to identify an abnormal respiratory pattern. Up to 7% of patients may develop intercostal retractions during periodic monitoring (21). Other authors have used automatic respiratory rate counters; however, they are not universally available and require cost-effectiveness studies. (22,23). It has also been previously shown that the sensitivity and specificity of caregivers is insufficient to recognize tachypnea and signs of respiratory distress in respiratory diseases and pneumonia (24).

On the subject of medical intervention, some parents chose no treatment in our study and that caused serious disagreement. When the original scale was evaluated, it was used before discharge. In our study, the parents were asked to complete the scale at the emergency room

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

(to avoid any memory bias) right after medical evaluation was done and a course of action was defined. Three observers filled it out at the same time to ensure that they were evaluating the same conditions instead of conditions that had changed. The question to be evaluated was if this scale required any previous training (prior to using it) or a specific guide that explained in greater detail how to score individual points on the scale in the parents' version. Other factors included in the study was the best time to ask parents to fill out the scale, their level of education, and the perceptions of parents and patients. Some patients do not consider being evaluated by a physician as some kind of medical "intervention," despite the act being described in the original ReSVinet Scale.

Agreement regarding the item 'general condition' was fair, but there was significant variability in the score. The explanation may be that the sample used was mainly for upper respiratory infection, and parents could overestimate their scores and lose objectivity when going to the emergency room (25,26). General condition is subjective and varies between parents and medical examiners since going from home to a hospital environment may cause changes in their comfort, state of mind, (calm, irritable, scared), their well-being (normal, feverish or sick). Therefore, it will be necessary to try to standardize these conditions when examining patients. It has been shown that there is a growing tendency to visit pediatric emergency rooms for reasons such as perceived severity of symptoms, the availability of continuous care that allows for assessment within a short period of time, and the perceived benefit of having been assessed by a pediatrician (11,27).

There was better agreement regarding feeding intolerance, and almost perfect agreement regarding fever. This is because both are easy to measure objectively since they are quite clear on the scale for parental use, thermometers are widely available in our environment,

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

and even the detection of fever by palpation has showed suitable sensitivity – 88% (95% CI 79% - 93%) (28, 29).

Cronbach's alpha was low and a possible theory for this is that it could be a result of assessing different respiratory diagnoses. Since the initial design was only for bronchiolitis, the result may be lower when various diseases with different symptoms are assessed. However, a larger sample of all diseases would be required to determine that. A universal scale for all ARIs is, in our opinion, a far better option than individual scales for each respiratory disease, since the literature shows that most scales that comply with Cornbach's alpha requirements are homogeneous, and that they assess patients suffering from only one specific cause of respiratory distress.

Regarding the lower agreement with parents, several variables may explain these findings: a) parents' expectations from the point of view of the healthcare setting where patients were recruited (the original study was done with hospitalized patients (15) while this study was done in the emergency room); b) the higher percentage of rhinopharyngitis in this study vs bronchiolitis in the original study (10); and c) Bogota's high altitude (2600 meters above sea level) can change the perception of symptoms, but this has not been carefully studied (28, 29).

One limitation in the study is that only three patients were diagnosed with pneumonia. Pneumonia is a leading cause of death in developing countries. Therefore, it would be relevant to have a representative sample of this condition. Another limitation is the low number of patients admitted to the PICU. Finally, another possible bias is the inclusion of families with mandatory insurance and only those that speak Spanish. If avoidable deaths in

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

infants are to be reduced, improved access to healthcare services must be a priority (23). The results of this study give rise to new hypotheses for studies designed to validate individual elements of the ReSVinet scale that may be easy for parents to complete. Additional studies involving lower respiratory tract infections are also needed.

CONCLUSION

The ReSVinet scale was found to have substantial reliability when used by HCW in the pediatric emergency area to assess ARI. In our population, agreement between scoring by HCW and that done by parents was moderate, and slight agreement was found for medical intervention and respiratory rate. The scale has been shown to be promising and reliable when used by healthcare personnel to assess the severity of acute respiratory infection in children under 2 years of age. Future studies should focus on finding ways to enable parents to use it reliability for two individual items so that it can be used in the emergency room.

REFERENCES

1. Piedimonte G, Perez MK. Respiratory syncytial virus infection and bronchiolitis. Pediatr Rev. 2014;35(12):519-30.

2. Collaborators GS. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):2091-138.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

3. Rodríguez-Martínez CE, Rodríguez DA, Nino G. Respiratory syncytial virus, adenoviruses, and mixed acute lower respiratory infections in children in a developing country. J Med Virol. 2015;87(5):774-81.

4. Bordley WC, Viswanathan M, King VJ, Sutton SF, Jackman AM, Sterling L, et al. Diagnosis and testing in bronchiolitis: a systematic review. Arch Pediatr Adolesc Med. 2004;158(2):119-26.

5. Doan Q, Enarson P, Kissoon N, Klassen TP, Johnson DW. Rapid viral diagnosis for acute febrile respiratory illness in children in the Emergency Department. Cochrane Database Syst Rev. 2014(9):CD006452.

6. Ralston SL, Lieberthal AS, Meissner HC, Alverson BK, Baley JE, Gadomski AM, et al. Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis. Pediatrics. 2014;134(5):e1474.

7. Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT. Child and Adolescent Health and Development: Realizing Neglected Potential. In: Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT, editors. Child and Adolescent Health and Development. 3rd ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017.

8. Rashid SF, Hadi A, Afsana K, Begum SA. Acute respiratory infections in rural Bangladesh: cultural understandings, practices and the role of mothers and community health volunteers. Trop Med Int Health. 2001;6(4):249-55.

9. Hildenwall H, Rutebemberwa E, Nsabagasani X, Pariyo G, Tomson G, Peterson S. Local illness concepts--implications for management of childhood pneumonia in eastern Uganda. Acta Trop. 2007;101(3):217-24.

10. Bham SQ, Saeed F, Shah MA. Knowledge, Attitude and Practice of mothers on acute respiratory infection in children under five years. Pak J Med Sci. 2016;32(6):1557-61.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

11. Kua PH, Wu L, Ong EL, Lim ZY, Yiew JL, Thia XH, et al. Understanding decisions leading to nonurgent visits to the paediatric emergency department: caregivers' perspectives. Singapore Med J. 2016;57(6):314-9.

12. Rodriguez-Martinez CE, Sossa-Briceño MP, Nino G. Systematic review of instruments aimed at evaluating the severity of bronchiolitis. Paediatr Respir Rev. 2018;25:43-57.

13. Destino L, Weisgerber MC, Soung P, Bakalarski D, Yan K, Rehborg R, et al. Validity of respiratory scores in bronchiolitis. Hosp Pediatr. 2012;2(4):202-9.

14. Bekhof J, Reimink R, Brand PL. Systematic review: insufficient validation of clinical scores for the assessment of acute dyspnoea in wheezing children. Paediatr Respir Rev. 2014;15(1):98-112.

15. Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS One. 2016;11(6):e0157665. https://doi.org/10.1371/journal.pone.0157665. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157665

16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.

17. Kou M, Hwang V, Ramkellawan N. Bronchiolitis: From Practice Guideline to Clinical Practice. Emerg Med Clin North Am. 2018;36(2):275-86.

18. Muro F, Mtove G, Mosha N, et al. Effect of context on respiratory rate measurement in identifying non-severe pneumonia in African children. Trop Med Int Health. 2015;20(6):757-765

19. Simoes EA, Roark R, Berman S, Esler LL, Murphy J. Respiratory rate: measurement of variability over time and accuracy at different counting periods. Arch Dis Child. 1991;66(10):1199-1203

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

20. Kahigwa E, Schellenberg D, Schellenberg JA, Aponte JJ, Alonso PL, Menendez C. Inter-observer variation in the assessment of clinical signs in sick Tanzanian children. Trans R Soc Trop Med Hyg 2002: 96: 162–166.

21. Lenahan JL, Nkwopara E, Phiri M, Mvalo T, Couasnon MT, Turner K, et al. Repeat assessment of examination signs among children in Malawi with fast-breathing pneumonia. ERJ Open Res. 2020;6(2):00275-2019

22. Källander K, Ward C, Smith H, Bhattarai R, Kc A, Timsina D et al. Usability and acceptability of an automated respiratory rate counter to assess childhood pneumonia in Nepal. Acta Paediatr. 2020;109(6):1207-1220

23 Ward C, Baker K, Marks S, Getachew D, Habte T, McWhorter C et al. Determining the Agreement Between an Automated Respiratory Rate Counter and a Reference Standard for Detecting Symptoms of Pneumonia in Children: Protocol for a Cross-Sectional Study in Ethiopia. JMIR Res Protoc. 2020;9(4):e16531

24. Geldsetzer P, Williams TC, Kirolos A, Mitchell S, Ratcliffe LA, Kohli-Lynch MK, et al. The recognition of and care seeking behaviour for childhood illness in developing countries: a systematic review. PLoS One. 2014;9(4):e93427.

25. Feudtner C, Walter JK, Faerber JA, Hill DL, Carroll KW, Mollen CJ, et al. Good-Parent beliefs of Parents of seriously ill children. JAMA Pediatr. 2015;169(1):39-47.

26. Kubicek K, Liu D, Beaudin C, Supan J, Weiss G, Lu Y, et al. A profile of nonurgent emergency department use in an urban pediatric hospital. Pediatr Emerg Care. 2012;28(10):977-84.

27. Muhe L. Mothers' perceptions of signs and symptoms of acute respiratory infections in their children and their assessment of severity in an urban community of Ethiopia. Ann Trop Paediatr. 1996;16(2):129-35.

28. Hutter D. "Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?". Paeditrica. 2006;17(1):49-51.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

29. Muro F, Meta J, Renju J, Mushi A, Mbakilwa H, Olomi R, et al. "It is good to take her early to the doctor" - mothers' understanding of childhood pneumonia symptoms and health care seeking in Kilimanjaro region, Tanzania. BMC Int Health Hum Rights. 2017;17(1):27.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 1. ReSVinet scale

Item	0 points	1 points	2 points	3 points
1 Feeding intolerance	No	Mild Decreased appetite and/or isolated vomits with cough.	Partial Frequent vomits with cough, rejected feed but able to tolerate fluids sufficiently to ensure hydration	Total Oral intolerance or absolute rejection of oral feed, not able to guarantee adequate hydration orally. Required nasogastric and/or intravenous fluids
2 Medical intervention	No	Basic Nasal secretions aspiration, physical examination, trial of nebulized bronchodilators, antipyretics.	Intermediate Oxygen therapy required. Complementary exams were needed (chest X-rays, blood gases, hematimetry...). Maintained nebulized therapy with bronchodilators.	High Required respiratory support with positive pressure (either non-invasive in CPAP, BiPAP or high-flow O2; or invasive through endotracheal tube).
3 Respiratory difficulty	No	Mild Not in basal situation but does not appear severe. Wheezing only audible with stethoscope, good air entrance. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates mild severity.	Moderate Makes some extra respiratory effort (intercostal and/or tracheosternal retraction). Presented expiratory wheezing audible even without stethoscope, and air entrance may be decreased in localized areas. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates moderate severity	Severe Respiratory effort is obvious. Inspiratory and expiratory wheezing and/or clearly decreased air entry. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates high severity.
4 Respiratory frequency	*Normal < 2 m: 40–50 bpm 2–6 m: 35–45 bpm 6-12m: 30–40 bpm 12-24m:25–35 bpm 24-36m: 20–30 bpm	Mild or occasional tachypnea Presented episodes of tachypnea, well tolerated, limited in time by self-resolution or response to secretion aspiration or nebulization	Prolonged or recurrent tachypnea Tachypnea persisted or recurred despite secretion aspiration and/or nebulization with bronchodilators	Severe alteration Severe and sustained tachypnea. Very superficial and quick breath rate. Normal/low breath rate with obvious increased respiratory effort and/or mental status affected. Orientative rates of severe tachypnea: < 2 m: > 70 bpm 2–6 m: > 60 bpm 6-12m: >55 bpm 12-24m: >50 bpm 24- 36m: >40 bpm
5 Apnea	No			Yes At least one episode of respiratory pause medically documented or strongly suggested through anamnesis.
6 General Condition	Normal	Mild Not in basal situation, child was mildly uncomfortable but does not appear to be in a severe condition, not impress of severity. Parents are not alarmed. Could wait in the waiting room or even stay at home	Moderate Patient looks ill, and will need medical exam and eventually further complementary exams and/ or therapy. Parents are concerned. Cannot wait in the waiting room	Severe Agitated, apathetic, lethargic. No need of medical training to realize severity. Parents are very concerned. Immediate medical evaluation and/or intervention were required.
7 Fever	No	Yes, mild Central T < 38.5°C	Yes, moderate Central T > 38.5°C	

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

* (m = months)

+ the original article also contains the version for parents

Reproduce from: Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. (2016) Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS ONE 11(6): e0157665. https://doi.org/10.1371/journal.pone.0157665.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 2. Clinical and demographic characteristics

VARIABLE	**Total n=188**
	n (%)
Age in months, median (IQR)	10 (4.5 - 16)
0-3 months	40 (21. 3)
4-12	66 (35.1)
>12 months	82 (43.6)
Gender, male	110 (58.5)
Diagnosis	
Rhinopharyngitis	76 (40.4)
Bronchiolitis	54 (28.7)
Croup	32 (17.1)
Wheezing	23 (12.2)
Pneumonia	3 (1.6)
Time from first symptoms, median (IQR)	3.5 (2 – 7)
1 to 7 days	143 (76)
8 to 14 days	24 (12. 8)
15 to 30 days	21 (11. 2)
Treatment decision	
Discharged	66 (35.1)
Short-term Observation (< 24 hours)	67 (35.6)
Hospital admission	55 (29.3)
Viral isolation tested	58 (30.8)
Negative	35 (18.6)
RSV	17 (9)
Adenovirus	3 (1.6)
Parainfluenza 1	2 (1.1)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Adenovirus and RSV	1 (0.5)
Length of stay in days, median (IQR)	3 (2 – 5)
0 to 7 days	178 (94.7)
8 to14 days	8 (4.3)
15 to 30 days	2 (1)
Antibiotic prescribed	9 (4.8)
PICU admission	5 (2.7)
30-day mortality, n= 182	0
Return visit before 10 days	25(13.3)
Discharged	10 (5.3)
Short-term Observation (<24 hours)	15 (7.9)
Hospital admission	0

IQR: interquartilic range; n: absolute number or decimal. % percentage; RSV: respiratory syncytial virus; PICU: Pediatric intensive care unit.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 3. Interobserver agreement for each item on the scale (weighted Kappa coefficient)

Item	Faculty vs Resident (95% IC)	Faculty vs Parent (95% IC)	Resident vs Parent (95% IC)
Feeding intolerance	0. 72 (0.64 – 0.77) Substantial	0.45 (0.42 – 0.49) Moderate	0.44 (0.35 – 0.46) Moderate
Medical intervention	0.88 (0.82 – 0.89) Almost perfect	0.07 (0.00 -0.12) Slight	0.26 (0.23 – 0.32) Fair
Respiratory difficulty	0.76 (0.73 – 0.85) Substantial	0.28 (0.22-0.36) Fair	0.26 (0.23 – 0.35) Fair
Respiratory frequency	0.86 (0.74 – 0.91) Almost perfect	0.08 (0.02 – 0.13) Slight	0.08 (0.05 – 0.17) Slight
Apnea	*	*	*
General condition	0.76 (0.71 – 0.82) Substantial	0.25 (0.25 – 0.30) Fair	0.34 (0.28 – 0.37) Fair
Fever	0.99 (0.99 – 1) Almost perfect	0.82 (0.74 – 0.88) Almost perfect	0.82 (0.78 – 0.87) Almost perfect
TOTAL	0.78 (0.76 – 0.80) Substantial	0.41 (0.36 – 0.47) Moderate	0.41 (0.32 – 0.49) Moderate

* Was not scored due to non-occurrence of symptom within observation period of the Faculty or Resident group.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 1. ReSVinet scale percentage by item

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 2. Scatter and Fitted Plot of ReSVinet score: faculty vs. parent

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 3. Scatter and Fitted Plot of ReSVinet score: resident vs. parent

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 4. Scatter and Fitted Plot of ReSVinet score: faculty vs. resident

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Corresponding author: Dr Jhon Camacho-Cruz, Associate Instructor, Department of Pediatrics, Fundación Universitaria de Ciencias de la Salud (FUCS), Cra 19 No. 8A – 32, Bogotá, Colombia. jhcamacho@fucsalud.edu.co

Co-authors: Camacho-Cruz Jhon[a], Briñez Shirley[a], Álvarez Jorge[a], Leal Victoria[a], Villamizar Gómez Licet[b], Vasquez-Hoyos Pablo[a]
Affiliations: [a]Department of Pediatrics. Fundación Universitaria de Ciencias de la Salud, Hospital de San José, and[b] Research Division. Fundación Universitaria de Ciencias de la Salud, Hospital de San José Bogotá, Colombia.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

Word count: 2771
Reference count: 29

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Short title: ReSVinet scale in a pediatric emergency setting.

Funding Source: None stated by the authors.

Financial Disclosure: All authors have indicated they have no financial relationships relevant to this article to disclose.

Conflict of interest: The authors have indicated they have no potential conflicts of interest to disclose.

Abbreviations:
ARI: Acute respiratory infection
HCW: Health Care Workers
RSV: Respiratory syncytial virus

What's Known: Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. The absence of a universally available scale to enable parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation.

What This Study Adds: There was good correlation of scores between health professionals. There was more variation between scores by parents and health professional.

Acknowledgements
We wish to thank Doctor Antonio Justicia-Grande for his support.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Contributors
JHC and LVG conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. SB, JA, VL and PVH designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. All authors conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content. All authors also approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Abstract

Introduction. Most scales for acute respiratory infection (ARI) are limited to Health Care Worker (HCW) use for clinical decision-making. The Respiratory Syncytial Virus network (ReSVinet) scale offers a version for parents that could potentially help as an early warning system.

Objective. To determine whether or not the ReSVinet scale for acute respiratory infection in infants is reliably used by HCW and parents at an emergency service.

Methods. A prospective study was done of infants with ARI who were admitted to a pediatric emergency room to assess the use of the ReSVinet scale when used by faculty (pediatric doctor-professors), residents (doctors doing their first specialty in pediatrics), and parents. The Spearman correlation and a weighted Kappa coefficient were used to measure inter-observer agreement. The internal consistency was also tested by Cronbach's alpha test.

Results. Overall, 188 patients, 58% male, were enrolled. A Spearman correlation of 0.92 for faculty and resident scoring and 0.64 for faculty or resident and parent scoring was found. The weighted Kappa coefficients were 0.78 for faculty vs. resident, 0.41 for faculty vs. parents, and 0.41 for resident vs. parents. Cronbach's alpha test was 0.67 for faculty, 0.62 for residents and 0.69 for parents.

Conclusion. There was a good correlation in ReSVinet scores by health professionals when used in the pediatric emergency area. Agreement between parents and health professionals was found to be more variable. Future studies should focus on finding ways to improve its reliability when used by parents before the scale is used in the emergency room.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

INTRODUCTION

Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. Although bronchiolitis, which is caused by the respiratory syncytial virus (RSV) occurs the most frequently (80%) (1), there are many respiratory syndromes that affect different areas of the respiratory tract involved and range from mild upper airway to severe and complicated lower airway diseases (2). There are multiple etiological factors in this group, most of them viral (3) although bacteria and fungi can also cause ARI. Diagnosis is based on the clinical findings, hence the importance of being well-informed regarding the signs and symptoms of the different respiratory diseases affecting children under 2 years of age in order to reduce mortality through accurate diagnosis and early intervention (4-6).

Every year 2.2 million children worldwide die from ARI. Reducing mortality in children under 5 years of age to less than 25 for every 1000 live births is one of the sustainable development goals for 2030 (2). Mortality in children under 5 has dropped from 12.7 million in 1990 to 5.6 million in 2016 as a result of advances achieved over the past 25 years (7-8). However, this reduction still falls short of the millennium goals. ARI is among the primary cause of disease in infants, and local beliefs regarding the different diseases and the use of home remedies or over-the-counter medications may delay care, thus increasing disease-related complications (8-11).

To date many scales have been developed to measure ARI severity. In all cases, respiratory rate is the most frequent item on them (81%), followed by the presence of abnormal breathing

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

sounds (78%) (12), which is the basis for most of these scales designed for healthcare workers (HCW) (13). The absence of a universally available scale for parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation (13, 14). A tool that can be used by parents or non-medical personnel to assess ARI severity needs to be validated (12, 15).

The Respiratory Syncytial Virus network (ReSVinet) scale was developed and submitted for evaluation by the Galician Pediatric Research Network and the FIVE research group with the collaboration of 90 pediatricians working in outpatient, inpatient, and intensive care settings (15). The scale is designed to assess global clinical severity in patients with ARI and may be used with ambulatory and hospitalized patients without the need for direct medical assessment. The scale can be used by HCW with information derived from medical records and by non-medical personnel (parents) by providing them with a simple tool for determining the severity of their child's condition (15). This tool consists of the following seven parameters: a) feeding intolerance, b) medical intervention, c) respiratory difficulty, d) respiratory frequency, e) apnea, f) general condition, and g) fever. The various parameters are assigned point values from 0 to 3 except for fever (0 to 2) which result in a total potential score of 20 points (Table 1) (15). The scale was validated by testing it on hospitalized children in three hospitals in Spain, but it has never been applied in a pediatric emergency room. The main objective of this study is to determine if the ReSVinet scale for assessing ARI severity in infants admitted to emergency at a general hospital in Bogotá, Colombia is reliable when used by HCW and parents.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

MATERIALS AND METHODS

An observational, descriptive cohort study was done of patients under 2 years of age admitted to the emergency room at our general hospital in Bogotá, Colombia that provides medical services for workers with mandatory insurance. The study included patients presenting signs and symptoms of any type of ARI (rhinopharyngitis, croup, bronchiolitis, wheezing episodes, or pneumonia). Parents were invited to participate by completing the scale were included. The study was done between late November 2017 and May 2018 (high season for respiratory diseases). Patients were only approached if the parents spoke Spanish and did not have significant comorbidities, e.g., heart disease, chronic lung disease, anatomical lung malformation, neurological diseases, severe malnutrition, any immune deficiency or cancer. The authors of the scale gave us authorization and provided the original version in Spanish. The language and content of the scale were reviewed by all attending physicians in our pediatric department who determined the suitability for Colombian clinicians and parents. Ten parents were tested on their understanding of the scale and the only difficulty found was with the term apnea. Thus, a specific explanation of the term was given to parents before they filled out the scale.

Patients were identified by the treating physicians who then contacted the researchers. The scale was completed at the same time by parents, pediatric doctor-professors (hereinafter faculty), doctors doing their first specialty in pediatrics (hereinafter residents) after the parents consented to participate. Follow up on discharged patients was done by telephone on day 10 after discharge to ask about new incidents that could lead to a return visit, if they required a re-admission to another hospital, or if they were continuing treatment at home. Patients admitted to the hospital were followed until discharge or at 30 days using the clinical

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

records to determine length of stay, need for admission to the pediatric intensive care unit (PICU), or the use of antibiotics. All parents were contacted again by phone after 30 days in order to determine if a fatal event had occurred following the ARI. The study was approved by the institutional review board and the hospital ethics review board (Comité de Ética en Investigación en Seres Humanos – CEISH – Hospital de San José).

Statistical analysis

The following parameters were taken into consideration for sample size: type I error, 0.05; type II error, 0.20; null hypothesis test value, 0.7; and population correlation coefficient, 0.82 as described in the article by Justicia-Grande et al. (15) for a final sample size of 191 patients. A univariate analysis was done and medians (p50) and interquartile (p25-p75) ranges were used for quantitative variables. Qualitative variables were reported in terms of percentages and absolute numbers. Total scores for faculty, residents, and parents are reported as are percentages by item for each level of severity. The comparison between total scores was done using the Mann-Whitney U test and analysis by individual items by ordinal logistic regression.

For internal consistency, a Cronbach's alpha test was done with the expectation of reaching a threshold of a least 0.7. A Spearman's correlation coefficient was used to test the strength and direction of the correlations between observers. Interobserver agreement for the total scale and for each item was also calculated using weighted Kappa coefficients for groups (faculty-resident, faculty-parent, resident-parent). A value of 0.01 - 0.2 was determined to have slight, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial, and 0.81 to 1 almost perfect agreement respectively (16). Each item was also compared by categories of

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

severity as selected by parent, faculty, or resident using an Ordered logistic regression. The Stata 13 software package was used for statistical analysis as well as for the calculation of the sample size and graphics, and Cronbach's alpha coefficients were analyzed using the R Statistical Software Package 4.0.2.

RESULTS

We initially enrolled 191 patients, but when the statistical analysis was done, two cases were found that did not meet the age criteria and one was lost to initial follow up. Table 2 shows their demographic and clinical characteristics. Median age was 10 (IQR 4.5 – 16) months, and 110 were males (58.5%). ARI diagnoses were rhinopharyngitis 40.4%, bronchiolitis 28.7%, croup 17.1%, wheezing episodes 12.2%, and pneumonia 1.6%. The average number of days between first symptoms and consultation was 5.9 ± 5.7. Of the total number of patients 29.3% were hospitalized, 35.6% stayed for a short-term observation (less than 24 hours), and 35.1% were discharged after initial assessment. Median hospital length of stay was 3 (IQR 2 – 5). Only 2.7% were admitted to the PICU and 4.8% received antibiotics. No deaths in this cohort were reported at the 30-day follow up call in 182 cases (96.8%). Six patients did not respond to the last follow up phone call.

Scores on the ReSVinet scale

All the observers completed the ReSVinet scale. The median total scale score was 5 (4 - 7) for faculty, 6 (4 - 7) for resident, and 6 (4 - 8) for parent. When total scores were compared, no significant differences were found (faculty vs resident p=0.66, faculty vs parent p=0.18, resident vs parent, p=0.33). Analysis by individual items showed statistical differences between parent and either faculty or resident on medical intervention, respiratory difficulty,

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

and frequency, p<0.01. For respiratory difficulty and rate, parents scored respiratory difficulty higher by choosing mild while HCW chose normal. Parents scored medical invention lower than HCW (Figure 1).

A look at Cronbach's alpha for total internal consistency of the scale revealed 0.67 (95% confidence interval 0.6– 0.74) for faculty, 0.62 (95% confidence interval 0.54 – 0.71) for resident and 0.69 (95% confidence interval 0.62– 0.75) for parents respectively. Overall Spearman's coefficient between faculty and resident was 0.92 (95% confidence interval 0.90– 0.95), 0.64 (95% confidence interval 0.55– 0.73) between faculty or resident and parent (Figures 2, 3 and 4). The weighted kappa coefficients were then examined and substantial agreement between faculty and resident (0.78, 95 CI 0.76-0.80), moderate agreement between faculty and parent (0.41, 95% CI 0.36-0.47), and between resident and parent, (0. 41, 95% CI 0.32-0.49) were found. Agreement for each item is shown in Table 3.

DISCUSSION

This study shows that the ReSVinet scale is highly reliable when used by HCW for assessing ARI in the pediatric emergency setting although it was lower when comparing use by parents and HCW. Substantial interobserver agreement was found between faculty and pediatric residents, but agreement between the healthcare workers and parents was moderate due to differences in scoring medical intervention, respiratory difficulty, and frequency items.

Advances intended to reduce morbidity and mortality in pediatric patients have taken place around the world over the past few years. Several studies show variations in the way ARI is diagnosed and treated in the pediatric population (17). The ReSVinet was designed to determine the severity of acute lower respiratory tract infections in infants. This study

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

included both lower and upper acute respiratory infections in the search for a more practical clinical application for infants with any significant respiratory disease. Moreover, because the study was a prospective concurrent enrollment, an attempt was made to avoid memory biases which may arise from the use of clinical records.

Significant variability was found in the individual elements of the scale, particularly in medical intervention and respiratory frequency and difficulty where agreement between the parents and the HCW was found to be slight or fair. When assessing respiratory rate, measurements should ideally be taken for 60 seconds and with a calm patient. In the case of children in an emergency room, this may be difficult to assess (18). Moreover, at younger ages, it can be more complex to assess as it varies based on the patient's own conditions (fever, crying, pain, hunger, and anxiety from being in an unfamiliar environment) (19). Other studies have shown poor agreement between parents and HCW regarding detection of respiratory distress with kappa values between 0.26 and 0.36 (20). We believe another way of measuring signs of respiratory distress such as frequent reassessments (every 3 hours) may make it easier to identify an abnormal respiratory pattern. Up to 7% of patients may develop intercostal retractions during periodic monitoring (21). Other authors have used automatic respiratory rate counters; however, they are not universally available and require cost-effectiveness studies. (22,23). It has also been previously shown that the sensitivity and specificity of caregivers is insufficient to recognize tachypnea and signs of respiratory distress in respiratory diseases and pneumonia (24).

On the subject of medical intervention, some parents chose no treatment in our study and that caused serious disagreement. When the original scale was evaluated, it was used before discharge. In our study, the parents were asked to complete the scale at the emergency room

(to avoid any memory bias) right after medical evaluation was done and a course of action was defined. Three observers filled it out at the same time to ensure that they were evaluating the same conditions instead of conditions that had changed. The question to be evaluated was if this scale required any previous training (prior to using it) or a specific guide that explained in greater detail how to score individual points on the scale in the parents' version. Other factors included in the study was the best time to ask parents to fill out the scale, their level of education, and the perceptions of parents and patients. Some patients do not consider being evaluated by a physician as some kind of medical "intervention," despite the act being described in the original ReSVinet Scale.

Agreement regarding the item 'general condition' was fair, but there was significant variability in the score. The explanation may be that the sample used was mainly for upper respiratory infection, and parents could overestimate their scores and lose objectivity when going to the emergency room (25,26). General condition is subjective and varies between parents and medical examiners since going from home to a hospital environment may cause changes in their comfort, state of mind, (calm, irritable, scared), their well-being (normal, feverish or sick). Therefore, it will be necessary to try to standardize these conditions when examining patients. It has been shown that there is a growing tendency to visit pediatric emergency rooms for reasons such as perceived severity of symptoms, the availability of continuous care that allows for assessment within a short period of time, and the perceived benefit of having been assessed by a pediatrician (11,27).

There was better agreement regarding feeding intolerance, and almost perfect agreement regarding fever. This is because both are easy to measure objectively since they are quite clear on the scale for parental use, thermometers are widely available in our environment,

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

and even the detection of fever by palpation has showed suitable sensitivity – 88% (95% CI 79% - 93%) (28, 29).

Cronbach's alpha was low and a possible theory for this is that it could be a result of assessing different respiratory diagnoses. Since the initial design was only for bronchiolitis, the result may be lower when various diseases with different symptoms are assessed. However, a larger sample of all diseases would be required to determine that. A universal scale for all ARIs is, in our opinion, a far better option than individual scales for each respiratory disease, since the literature shows that most scales that comply with Cornbach's alpha requirements are homogeneous, and that they assess patients suffering from only one specific cause of respiratory distress.

Regarding the lower agreement with parents, several variables may explain these findings: a) parents' expectations from the point of view of the healthcare setting where patients were recruited (the original study was done with hospitalized patients (15) while this study was done in the emergency room); b) the higher percentage of rhinopharyngitis in this study vs bronchiolitis in the original study (10); and c) Bogota's high altitude (2600 meters above sea level) can change the perception of symptoms, but this has not been carefully studied (28, 29).

One limitation in the study is that only three patients were diagnosed with pneumonia. Pneumonia is a leading cause of death in developing countries. Therefore, it would be relevant to have a representative sample of this condition. Another limitation is the low number of patients admitted to the PICU. Finally, another possible bias is the inclusion of families with mandatory insurance and only those that speak Spanish. If avoidable deaths in

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

infants are to be reduced, improved access to healthcare services must be a priority (23). The results of this study give rise to new hypotheses for studies designed to validate individual elements of the ReSVinet scale that may be easy for parents to complete. Additional studies involving lower respiratory tract infections are also needed.

CONCLUSION

The ReSVinet scale was found to have substantial reliability when used by HCW in the pediatric emergency area to assess ARI. In our population, agreement between scoring by HCW and that done by parents was moderate, and slight agreement was found for medical intervention and respiratory rate. The scale has been shown to be promising and reliable when used by healthcare personnel to assess the severity of acute respiratory infection in children under 2 years of age. Future studies should focus on finding ways to enable parents to use it reliability for two individual items so that it can be used in the emergency room.

REFERENCES

1. Piedimonte G, Perez MK. Respiratory syncytial virus infection and bronchiolitis. Pediatr Rev. 2014;35(12):519-30.

2. Collaborators GS. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):2091-138.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

3. Rodríguez-Martínez CE, Rodríguez DA, Nino G. Respiratory syncytial virus, adenoviruses, and mixed acute lower respiratory infections in children in a developing country. J Med Virol. 2015;87(5):774-81.

4. Bordley WC, Viswanathan M, King VJ, Sutton SF, Jackman AM, Sterling L, et al. Diagnosis and testing in bronchiolitis: a systematic review. Arch Pediatr Adolesc Med. 2004;158(2):119-26.

5. Doan Q, Enarson P, Kissoon N, Klassen TP, Johnson DW. Rapid viral diagnosis for acute febrile respiratory illness in children in the Emergency Department. Cochrane Database Syst Rev. 2014(9):CD006452.

6. Ralston SL, Lieberthal AS, Meissner HC, Alverson BK, Baley JE, Gadomski AM, et al. Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis. Pediatrics. 2014;134(5):e1474.

7. Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT. Child and Adolescent Health and Development: Realizing Neglected Potential. In: Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT, editors. Child and Adolescent Health and Development. 3rd ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017.

8. Rashid SF, Hadi A, Afsana K, Begum SA. Acute respiratory infections in rural Bangladesh: cultural understandings, practices and the role of mothers and community health volunteers. Trop Med Int Health. 2001;6(4):249-55.

9. Hildenwall H, Rutebemberwa E, Nsabagasani X, Pariyo G, Tomson G, Peterson S. Local illness concepts--implications for management of childhood pneumonia in eastern Uganda. Acta Trop. 2007;101(3):217-24.

10. Bham SQ, Saeed F, Shah MA. Knowledge, Attitude and Practice of mothers on acute respiratory infection in children under five years. Pak J Med Sci. 2016;32(6):1557-61.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

11. Kua PH, Wu L, Ong EL, Lim ZY, Yiew JL, Thia XH, et al. Understanding decisions leading to nonurgent visits to the paediatric emergency department: caregivers' perspectives. Singapore Med J. 2016;57(6):314-9.

12. Rodriguez-Martinez CE, Sossa-Briceño MP, Nino G. Systematic review of instruments aimed at evaluating the severity of bronchiolitis. Paediatr Respir Rev. 2018;25:43-57.

13. Destino L, Weisgerber MC, Soung P, Bakalarski D, Yan K, Rehborg R, et al. Validity of respiratory scores in bronchiolitis. Hosp Pediatr. 2012;2(4):202-9.

14. Bekhof J, Reimink R, Brand PL. Systematic review: insufficient validation of clinical scores for the assessment of acute dyspnoea in wheezing children. Paediatr Respir Rev. 2014;15(1):98-112.

15. Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS One. 2016;11(6):e0157665. https://doi.org/10.1371/journal.pone.0157665. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157665

16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.

17. Kou M, Hwang V, Ramkellawan N. Bronchiolitis: From Practice Guideline to Clinical Practice. Emerg Med Clin North Am. 2018;36(2):275-86.

18. Muro F, Mtove G, Mosha N, et al. Effect of context on respiratory rate measurement in identifying non-severe pneumonia in African children. Trop Med Int Health. 2015;20(6):757-765

19. Simoes EA, Roark R, Berman S, Esler LL, Murphy J. Respiratory rate: measurement of variability over time and accuracy at different counting periods. Arch Dis Child. 1991;66(10):1199-1203

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

20. Kahigwa E, Schellenberg D, Schellenberg JA, Aponte JJ, Alonso PL, Menendez C. Inter-observer variation in the assessment of clinical signs in sick Tanzanian children. Trans R Soc Trop Med Hyg 2002: 96: 162–166.

21. Lenahan JL, Nkwopara E, Phiri M, Mvalo T, Couasnon MT, Turner K, et al. Repeat assessment of examination signs among children in Malawi with fast-breathing pneumonia. ERJ Open Res. 2020;6(2):00275-2019

22. Källander K, Ward C, Smith H, Bhattarai R, Kc A, Timsina D et al. Usability and acceptability of an automated respiratory rate counter to assess childhood pneumonia in Nepal. Acta Paediatr. 2020;109(6):1207-1220

23 Ward C, Baker K, Marks S, Getachew D, Habte T, McWhorter C et al. Determining the Agreement Between an Automated Respiratory Rate Counter and a Reference Standard for Detecting Symptoms of Pneumonia in Children: Protocol for a Cross-Sectional Study in Ethiopia. JMIR Res Protoc. 2020;9(4):e16531

24. Geldsetzer P, Williams TC, Kirolos A, Mitchell S, Ratcliffe LA, Kohli-Lynch MK, et al. The recognition of and care seeking behaviour for childhood illness in developing countries: a systematic review. PLoS One. 2014;9(4):e93427.

25. Feudtner C, Walter JK, Faerber JA, Hill DL, Carroll KW, Mollen CJ, et al. Good-Parent beliefs of Parents of seriously ill children. JAMA Pediatr. 2015;169(1):39-47.

26. Kubicek K, Liu D, Beaudin C, Supan J, Weiss G, Lu Y, et al. A profile of nonurgent emergency department use in an urban pediatric hospital. Pediatr Emerg Care. 2012;28(10):977-84.

27. Muhe L. Mothers' perceptions of signs and symptoms of acute respiratory infections in their children and their assessment of severity in an urban community of Ethiopia. Ann Trop Paediatr. 1996;16(2):129-35.

28. Hutter D. "Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?". Paeditrica. 2006;17(1):49-51.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

29. Muro F, Meta J, Renju J, Mushi A, Mbakilwa H, Olomi R, et al. "It is good to take her early to the doctor" - mothers' understanding of childhood pneumonia symptoms and health care seeking in Kilimanjaro region, Tanzania. BMC Int Health Hum Rights. 2017;17(1):27.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 1. ReSVinet scale

Item	0 points	1 points	2 points	3 points
1 Feeding intolerance	No	Mild Decreased appetite and/or isolated vomits with cough.	Partial Frequent vomits with cough, rejected feed but able to tolerate fluids sufficiently to ensure hydration	Total Oral intolerance or absolute rejection of oral feed, not able to guarantee adequate hydration orally. Required nasogastric and/or intravenous fluids
2 Medical intervention	No	Basic Nasal secretions aspiration, physical examination, trial of nebulized bronchodilators, antipyretics.	Intermediate Oxygen therapy required. Complementary exams were needed (chest X-rays, blood gases, hematimetry...). Maintained nebulized therapy with bronchodilators.	High Required respiratory support with positive pressure (either non-invasive in CPAP, BiPAP or high-flow O2; or invasive through endotracheal tube).
3 Respiratory difficulty	No	Mild Not in basal situation but does not appear severe. Wheezing only audible with stethoscope, good air entrance. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates mild severity.	Moderate Makes some extra respiratory effort (intercostal and/or tracheosternal retraction). Presented expiratory wheezing audible even without stethoscope, and air entrance may be decreased in localized areas. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates moderate severity	Severe Respiratory effort is obvious. Inspiratory and expiratory wheezing and/or clearly decreased air entry. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates high severity.
4 Respiratory frequency	*Normal < 2 m: 40–50 bpm 2–6 m: 35–45 bpm 6-12m: 30–40 bpm 12-24m:25–35 bpm 24-36m: 20–30 bpm	Mild or occasional tachypnea Presented episodes of tachypnea, well tolerated, limited in time by self-resolution or response to secretion aspiration or nebulization	Prolonged or recurrent tachypnea Tachypnea persisted or recurred despite secretion aspiration and/or nebulization with bronchodilators	Severe alteration Severe and sustained tachypnea. Very superficial and quick breath rate. Normal/low breath rate with obvious increased respiratory effort and/or mental status affected. Orientative rates of severe tachypnea: < 2 m: > 70 bpm 2–6 m: > 60 bpm 6-12m: >55 bpm 12-24m: >50 bpm 24- 36m: >40 bpm
5 Apnea	No			Yes At least one episode of respiratory pause medically documented or strongly suggested through anamnesis.
6 General Condition	Normal	Mild Not in basal situation, child was mildly uncomfortable but does not appear to be in a severe condition, not impress of severity. Parents are not alarmed. Could wait in the waiting room or even stay at home	Moderate Patient looks ill, and will need medical exam and eventually further complementary exams and/ or therapy. Parents are concerned. Cannot wait in the waiting room	Severe Agitated, apathetic, lethargic. No need of medical training to realize severity. Parents are very concerned. Immediate medical evaluation and/or intervention were required.
7 Fever	No	Yes, mild Central T < 38.5°C	Yes, moderate Central T > 38.5°C	

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

* (m = months)

+ the original article also contains the version for parents

Reproduce from: Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. (2016) Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS ONE 11(6): e0157665. https://doi.org/10.1371/journal.pone.0157665.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 2. Clinical and demographic characteristics

VARIABLE	**Total n=188**
	n (%)
Age in months, median (IQR)	10 (4.5 - 16)
0-3 months	40 (21. 3)
4-12	66 (35.1)
>12 months	82 (43.6)
Gender, male	110 (58.5)
Diagnosis	
Rhinopharyngitis	76 (40.4)
Bronchiolitis	54 (28.7)
Croup	32 (17.1)
Wheezing	23 (12.2)
Pneumonia	3 (1.6)
Time from first symptoms, median (IQR)	3.5 (2 – 7)
1 to 7 days	143 (76)
8 to 14 days	24 (12. 8)
15 to 30 days	21 (11. 2)
Treatment decision	
Discharged	66 (35.1)
Short-term Observation (< 24 hours)	67 (35.6)
Hospital admission	55 (29.3)
Viral isolation tested	58 (30.8)
Negative	35 (18.6)
RSV	17 (9)
Adenovirus	3 (1.6)
Parainfluenza 1	2 (1.1)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Adenovirus and RSV	1 (0.5)
Length of stay in days, median (IQR)	3 (2 – 5)
0 to 7 days	178 (94.7)
8 to14 days	8 (4.3)
15 to 30 days	2 (1)
Antibiotic prescribed	9 (4.8)
PICU admission	5 (2.7)
30-day mortality, n= 182	0
Return visit before 10 days	25(13.3)
Discharged	10 (5.3)
Short-term Observation (<24 hours)	15 (7.9)
Hospital admission	0

IQR: interquartilic range; n: absolute number or decimal. % percentage; RSV: respiratory syncytial virus; PICU: Pediatric intensive care unit.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 3. Interobserver agreement for each item on the scale (weighted Kappa coefficient)

Item	Faculty vs Resident (95% IC)	Faculty vs Parent (95% IC)	Resident vs Parent (95% IC)
Feeding intolerance	0. 72 (0.64 – 0.77) Substantial	0.45 (0.42 – 0.49) Moderate	0.44 (0.35 – 0.46) Moderate
Medical intervention	0.88 (0.82 – 0.89) Almost perfect	0.07 (0.00 -0.12) Slight	0.26 (0.23 – 0.32) Fair
Respiratory difficulty	0.76 (0.73 – 0.85) Substantial	0.28 (0.22-0.36) Fair	0.26 (0.23 – 0.35) Fair
Respiratory frequency	0.86 (0.74 – 0.91) Almost perfect	0.08 (0.02 – 0.13) Slight	0.08 (0.05 – 0.17) Slight
Apnea	*	*	*
General condition	0.76 (0.71 – 0.82) Substantial	0.25 (0.25 – 0.30) Fair	0.34 (0.28 – 0.37) Fair
Fever	0.99 (0.99 – 1) Almost perfect	0.82 (0.74 – 0.88) Almost perfect	0.82 (0.78 – 0.87) Almost perfect
TOTAL	0.78 (0.76 – 0.80) Substantial	0.41 (0.36 – 0.47) Moderate	0.41 (0.32 – 0.49) Moderate

* Was not scored due to non-occurrence of symptom within observation period of the Faculty or Resident group.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 1. ReSVinet scale percentage by item

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 2. Scatter and Fitted Plot of ReSVinet score: faculty vs. parent

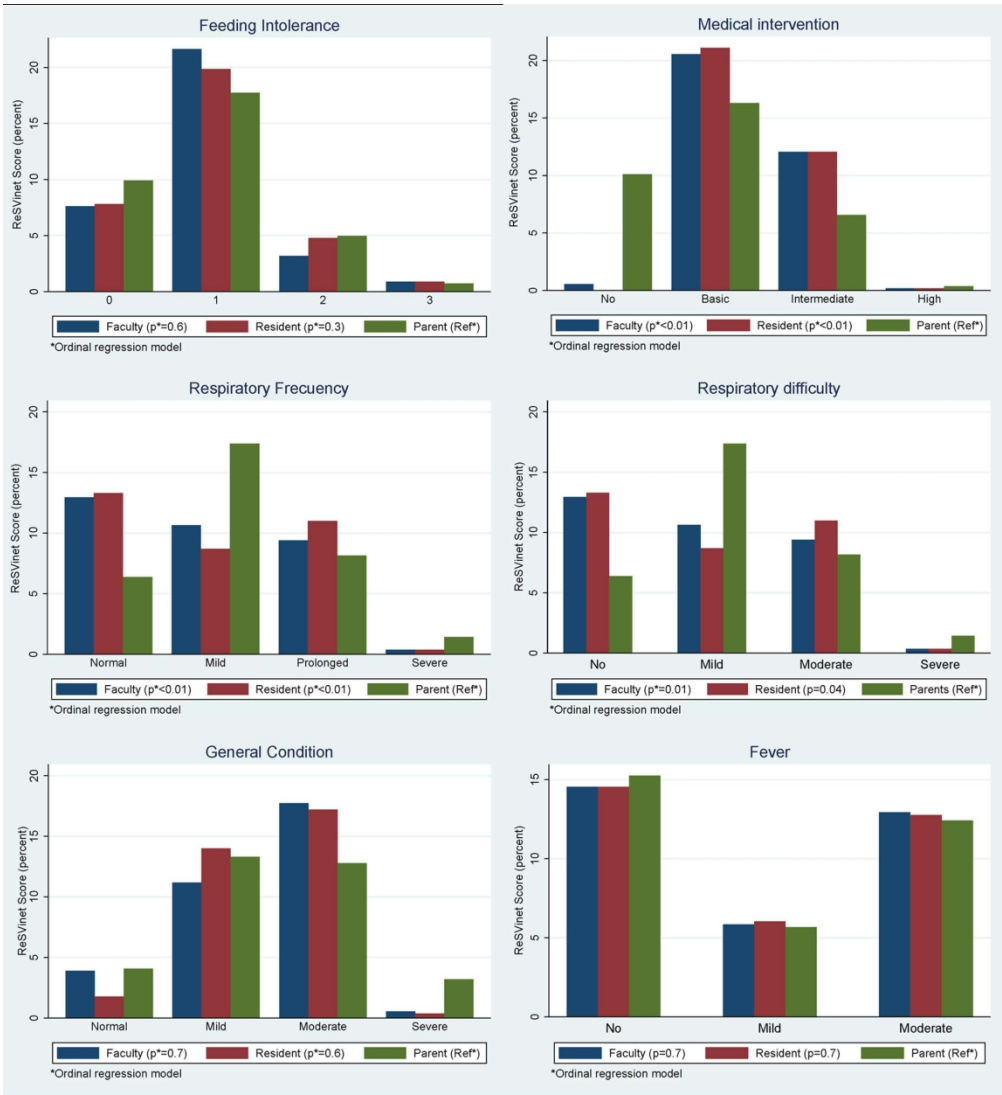
bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 3. Scatter and Fitted Plot of ReSVinet score: resident vs. parent

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

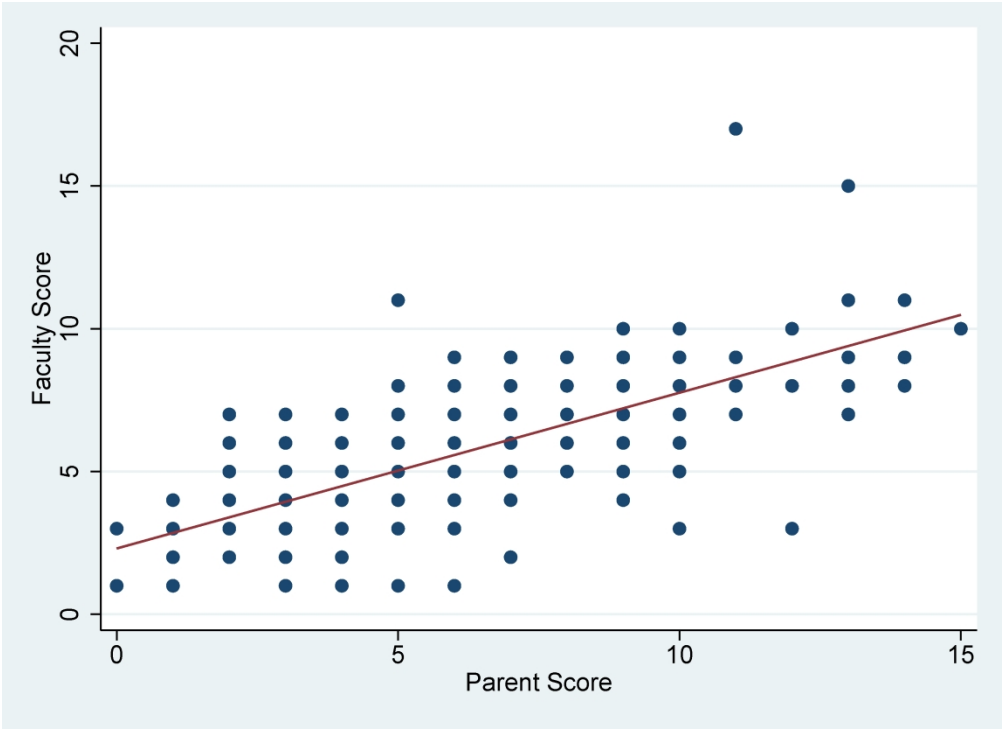
Figure 4. Scatter and Fitted Plot of ReSVinet score: faculty vs. resident

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



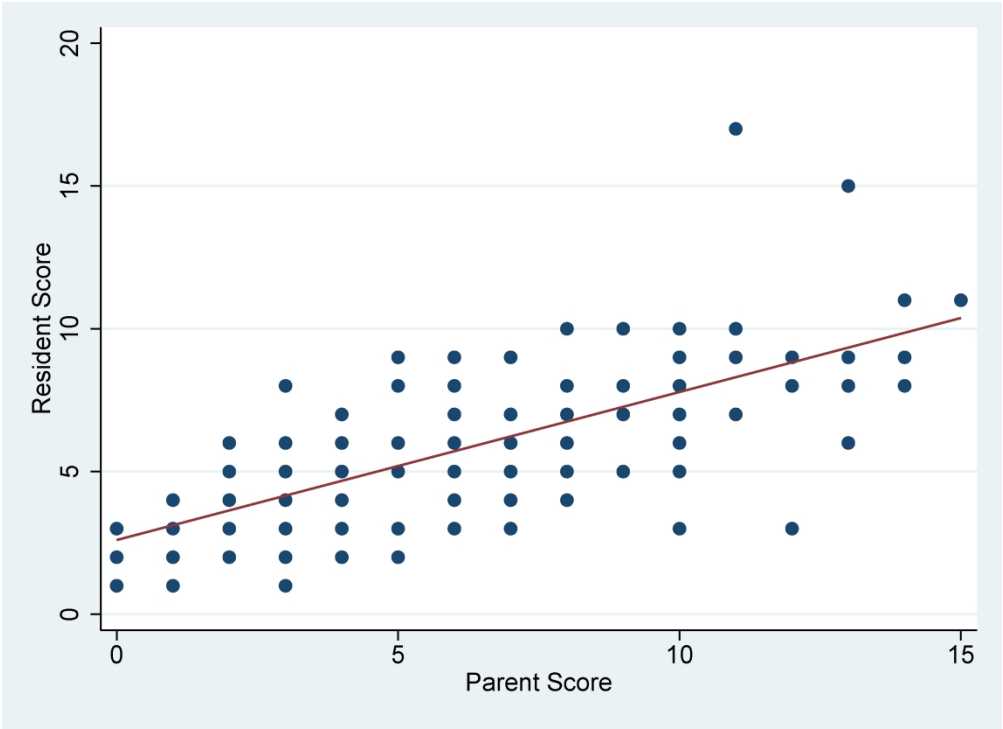
2117x2309mm (72 x 72 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



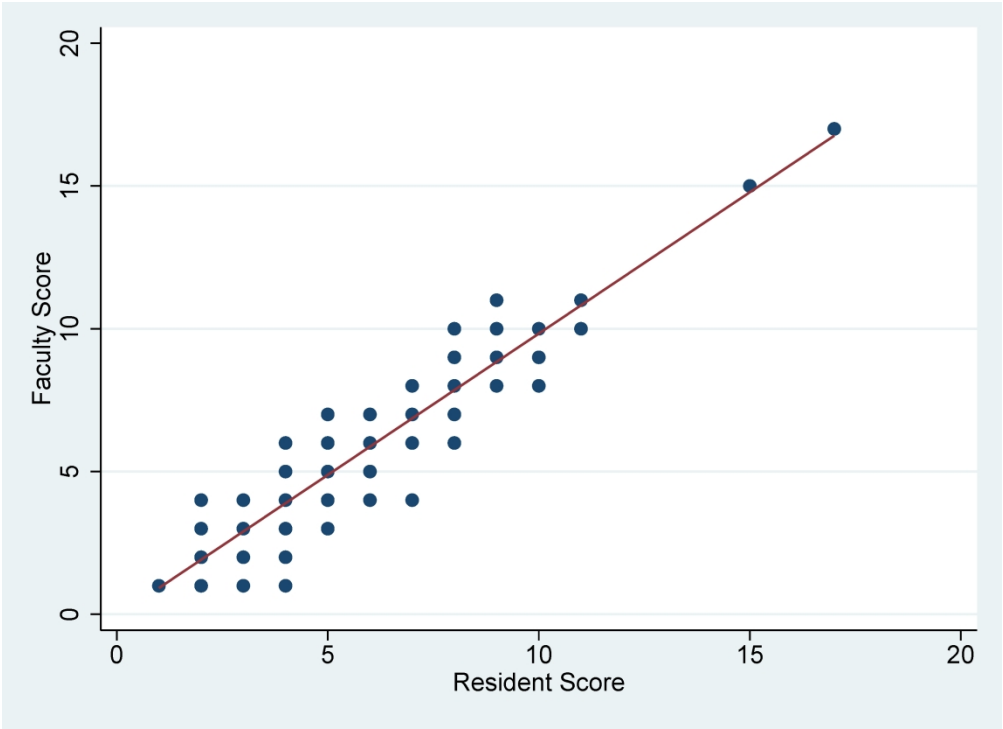
139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

BMJ Paediatrics Open

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Journal:	*BMJ Paediatrics Open*
Manuscript ID	bmjpo-2020-000966.R2
Article Type:	Original research
Date Submitted by the Author:	02-Apr-2021
Complete List of Authors:	Camacho-Cruz, Jhon; Fundacion Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José, Fundación Universitaria de Ciencias de la Salud (FUCS) Briñez, Shirley ; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José, Fundación Universitaria de Ciencias de la Salud (FUCS) Alvarez, Jorge; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José, Fundación Universitaria de Ciencias de la Salud (FUCS) Leal, Victoria; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José, Fundación Universitaria de Ciencias de la Salud (FUCS) Villamizar Gómez , Licet; Fundación Universitaria de Ciencias de la Salud, Research Division Fundación Universitaria de Ciencias de la Salud (FUCS) Vasquez-Hoyos, Pablo; Fundación Universitaria de Ciencias de la Salud, Department of Pediatrics Hospital de San José, Fundación Universitaria de Ciencias de la Salud (FUCS)
Keywords:	Health services research

SCHOLARONE™
Manuscripts

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Confidential: For Review Only

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Corresponding author: Dr Jhon Camacho-Cruz, Associate Instructor, Department of Pediatrics, Fundación Universitaria de Ciencias de la Salud (FUCS), Cra 19 No. 8A – 32, Bogotá, Colombia. jhcamacho@fucsalud.edu.co

Co-authors: Camacho-Cruz Jhon[a], Briñez Shirley[a], Álvarez Jorge[a], Leal Victoria[a], Villamizar Gómez Licet[b], Vasquez-Hoyos Pablo[a]

Affiliations: [a]Department of Pediatrics. Fundación Universitaria de Ciencias de la Salud, Hospital de San José, and[b] Research Division. Fundación Universitaria de Ciencias de la Salud, Hospital de San José Bogotá, Colombia.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

Word count: 2836

Reference count: 29

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Short title: ReSVinet scale in a pediatric emergency setting.

Funding Source: None stated by the authors.

Financial Disclosure: All authors have indicated they have no financial relationships relevant to this article to disclose.

Conflict of interest: The authors have indicated they have no potential conflicts of interest to disclose.

Abbreviations:
ARI: Acute respiratory infection
HCW: Health Care Workers
RSV: Respiratory syncytial virus

What's Known: Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. The absence of a universally available scale to enable parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation.

What This Study Adds: There was good correlation of scores between health professionals. There was more variation between scores by parents and health professionals.

Acknowledgements
We wish to thank Doctor Antonio Justicia-Grande for his support.

Patient and public involvement
Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Contributors
JHC and LVG conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript. SB, JA, VL and PVH designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript. All authors conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content. All authors also approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Use of the ReSVinet scale for parents and health care workers in a pediatric emergency service: a prospective study

Abstract

Introduction. Most scales for acute respiratory infection (ARI) are limited to Health Care Worker (HCW) use for clinical decision-making. The Respiratory Syncytial Virus network (ReSVinet) scale offers a version for parents that could potentially help as an early warning system.

Objective. To determine whether or not the ReSVinet scale for acute respiratory infection in infants is reliably used by HCW and parents at an emergency service.

Methods. A prospective study was done of infants with ARI who were admitted to a pediatric emergency room to assess the use of the ReSVinet scale when used by faculty (pediatric doctor-professors), residents (doctors doing their first specialty in pediatrics), and parents. The Spearman correlation and a weighted Kappa coefficient were used to measure inter-observer agreement. The internal consistency was also tested by Cronbach's alpha test.

Results. Overall, 188 patients, 58% male, were enrolled. A Spearman correlation of 0.92 for faculty and resident scoring and 0.64 for faculty or resident and parent scoring was found. The weighted Kappa coefficients were 0.78 for faculty vs. resident, 0.41 for faculty vs. parents, and 0.41 for resident vs. parents. Cronbach's alpha test was 0.67 for faculty, 0.62 for residents and 0.69 for parents.

Conclusion. There was a good correlation in ReSVinet scores by health professionals when used in the pediatric emergency area. Agreement between parents and health professionals was found to be more variable. Future studies should focus on finding ways to improve its reliability when used by parents before the scale is used in the emergency room.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Keywords: Severity of Illness Index; Respiratory Tract Diseases; Observer Variation; Reproducibility of Results; Emergency Medical Services.

INTRODUCTION

Acute respiratory infection (ARI) is an important cause of morbidity and mortality in children under 2 years of age. Although bronchiolitis, which is caused by the respiratory syncytial virus (RSV) occurs the most frequently (80%) (1), there are many respiratory syndromes that affect different areas of the respiratory tract involved and range from mild upper airway to severe and complicated lower airway diseases (2). There are multiple etiological factors in this group, most of them viral (3) although bacteria and fungi can also cause ARI. Diagnosis is based on the clinical findings, hence the importance of being well-informed regarding the signs and symptoms of the different respiratory diseases affecting children under 2 years of age in order to reduce mortality through accurate diagnosis and early intervention (4-6).

Every year 2.2 million children worldwide die from ARI. Reducing mortality in children under 5 years of age to less than 25 for every 1000 live births is one of the sustainable development goals for 2030 (2). Mortality in children under 5 has dropped from 12.7 million in 1990 to 5.6 million in 2016 as a result of advances achieved over the past 25 years (7-8). However, this reduction still falls short of the millennium goals. ARI is among the primary cause of disease in infants, and local beliefs regarding the different diseases and the use of home remedies or over-the-counter medications may delay care, thus increasing disease-related complications (8-11).

To date many scales have been developed to measure ARI severity. In all cases, respiratory rate is the most frequent item on them (81%), followed by the presence of abnormal breathing

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

sounds (78%) (12), which is the basis for most of these scales designed for healthcare workers (HCW) (13). The absence of a universally available scale for parents to measure severity so that they can determine when to bring the child in for medical assessment is a major limitation (13, 14). A tool that can be used by parents or non-medical personnel to assess ARI severity needs to be validated (12, 15).

The Respiratory Syncytial Virus network (ReSVinet) scale was developed and submitted for evaluation by the Galician Pediatric Research Network and the FIVE research group with the collaboration of 90 pediatricians working in outpatient, inpatient, and intensive care settings (15). The scale is designed to assess global clinical severity in patients with ARI and may be used with ambulatory and hospitalized patients without the need for direct medical assessment. The scale can be used by HCW with information derived from medical records and by non-medical personnel (parents) by providing them with a simple tool for determining the severity of their child's condition (15). This tool consists of the following seven parameters: a) feeding intolerance, b) medical intervention, c) respiratory difficulty, d) respiratory frequency, e) apnea, f) general condition, and g) fever. The various parameters are assigned point values from 0 to 3 except for fever (0 to 2) which result in a total potential score of 20 points (Table 1) (15). The scale was validated by testing it on hospitalized children in three hospitals in Spain, but it has never been applied in a pediatric emergency room. The main objective of this study is to determine if the ReSVinet scale for assessing ARI severity in infants admitted to emergency at a general hospital in Bogotá, Colombia is reliable when used by HCW and parents.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

MATERIALS AND METHODS

An observational, descriptive cohort study was done on patients under 2 years of age admitted to the emergency room at our general hospital in Bogotá, Colombia that provides medical services for workers with mandatory insurance. The study included patients presenting signs and symptoms of any type of ARI (rhinopharyngitis, croup, bronchiolitis, wheezing episodes, or pneumonia). Parents were invited to participate by filling out/by completing the scale and those who completed it were included. The study was done between late November 2017 and May 2018 (high season for respiratory diseases). Patients were only approached if the parents spoke Spanish and did not have significant comorbidities, e.g., heart disease, chronic lung disease, anatomical lung malformation, neurological diseases, severe malnutrition, any immune deficiency or cancer. The authors of the scale gave us authorization and provided the original version in Spanish. The language and content of the scale were reviewed by all attending physicians in our pediatric department who determined the suitability for Colombian clinicians and parents. A convenience random sample of 10 parents was chosen on their understanding of the scale and the only difficulty found was with the term apnea. Thus, a specific explanation of the term was given to parents before they filled out the scale.

Patients were identified by the treating physicians who then contacted the researchers. The scale was completed at the same time by parents, pediatric doctor-professors (hereinafter faculty), doctors doing their first specialty in pediatrics (hereinafter residents) after the parents consented to participate. Follow up on discharged patients was done by telephone on day 10 after discharge to ask about new incidents that could lead to a return visit, if they required a re-admission to another hospital, or if they were continuing treatment at home. Patients admitted to the hospital were followed until discharge or at 30 days using the clinical

records to determine length of stay, need for admission to the pediatric intensive care unit (PICU), or the use of antibiotics. All parents were contacted again by phone after 30 days in order to determine if a fatal event had occurred following the ARI. The follow-up was carried out on day 10 after the onset of the disease in an effort to detect the higher incidence of respiratory failure and admission to the PICU and the follow-up on day 30 to detect recovery from the disease or mortality in most patients with lower respiratory tract infection. The study was approved by the institutional review board and the hospital ethics review board (Comité de Ética en Investigación en Seres Humanos – CEISH – Hospital de San José).

Statistical analysis

The following parameters were taken into consideration for sample size: type I error, 0.05; type II error, 0.20; null hypothesis test value, 0.7; and population correlation coefficient, 0.82 as described in the article by Justicia-Grande et al. (15) for a final sample size of 191 patients. A univariate analysis was done and medians (p50) and interquartile (p25-p75) ranges were used for quantitative variables. Qualitative variables were reported in terms of percentages and absolute numbers. Total scores for faculty, residents, and parents are reported as are percentages by item for each level of severity. The comparison between total scores was done using the Mann-Whitney U test and analysis by individual items by ordinal logistic regression.

For internal consistency, a Cronbach's alpha test was calculated with the expectation of reaching a threshold of a least 0.7. A Spearman's correlation coefficient was used to test the strength and direction of the correlations between observers. Interobserver agreement for the total scale and for each item was also calculated using weighted Kappa coefficients for

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

groups (faculty-resident, faculty-parent, resident-parent). A value of 0.01 - 0.2 was determined to have slight, 0.21 to 0.40 fair, 0.41 to 0.60 moderate, 0.61 to 0.80 substantial, and 0.81 to 1 almost perfect agreement respectively (16). Each item was also compared by categories of severity as selected by parent, faculty, or resident using an Ordered logistic regression. The Stata 13 software package was used for statistical analysis as well as for the calculation of the sample size and graphics, and Cronbach's alpha coefficients were analyzed using the R Statistical Software Package 4.0.2.

RESULTS

We initially enrolled 191 patients, but when the statistical analysis was done, two cases were found that did not meet the age criteria and one was lost to initial follow up. Table 2 shows their demographic and clinical characteristics. Median age was 10 (IQR 4.5 – 16) months, and 110 were males (58.5%). ARI diagnoses were rhinopharyngitis 40.4%, bronchiolitis 28.7%, croup 17.1%, wheezing episodes 12.2%, and pneumonia 1.6%. Median of days first symptoms and consultation was 3.5 (IQR 2 -7). Of the total number of patients 29.3% were hospitalized, 35.6% stayed for a short-term observation (less than 24 hours), and 35.1% were discharged after initial assessment. Median hospital length of stay was 3 (IQR 2 – 5). Only 2.7% were admitted to the PICU and 4.8% received antibiotics. No deaths in this cohort were reported at the 30-day follow up call in 182 cases (96.8%). Six patients did not respond to the last follow up phone call.

Scores on the ReSVinet scale

All the observers completed the ReSVinet scale. The median total scale score was 5 (IQR 4 - 7) for faculty, 6 (IQR 4 - 7) for resident, and 6 (IQR 4 - 8) for parent. When total scores

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

were compared, no significant differences were found (faculty vs resident p=0.66, faculty vs parent p=0.18, resident vs parent, p=0.33). Analysis by individual items showed statistical differences between parent and either faculty or resident on medical intervention, respiratory difficulty, and frequency, p<0.01. For respiratory difficulty and rate, parents scored respiratory difficulty higher by choosing mild while HCW chose normal. Parents scored medical invention lower than HCW (Figure 1).

A look at Cronbach's alpha for total internal consistency of the scale revealed 0.67 (95% confidence interval 0.6– 0.74) for faculty, 0.62 (95% confidence interval 0.54 – 0.71) for resident and 0.69 (95% confidence interval 0.62– 0.75) for parents, respectively. Overall Spearman's coefficient between faculty and resident was 0.92 (95% confidence interval 0.90– 0.95), 0.64 (95% confidence interval 0.55– 0.73) between faculty or resident and parent (Figures 2, 3 and 4). The weighted kappa coefficients were then examined and substantial agreement between faculty and resident (0.78, 95% CI 0.76-0.80), moderate agreement between faculty and parent (0.41, 95% CI 0.36-0.47), and between resident and parent, (0. 41, 95% CI 0.32-0.49) were found. Agreement for each item is shown in Table 3.

DISCUSSION

This study shows that the ReSVinet scale has very good reliability when used by HCW for assessing ARI in the pediatric emergency setting although it was lower when comparing use by parents and HCW. Substantial interobserver agreement was found between faculty and pediatric residents, but agreement between the healthcare workers and parents was moderate due to differences in scoring medical intervention, respiratory difficulty, and frequency items.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Advances intended to reduce morbidity and mortality in pediatric patients have taken place around the world over the past few years. Several studies show variations in the way ARI is diagnosed and treated in the pediatric population (17). The ReSVinet was designed to determine the severity of acute lower respiratory tract infections in infants. This study included both lower and upper acute respiratory infections in the search for a more practical clinical application for infants with any significant respiratory disease. Moreover, because the study was a prospective concurrent enrollment, an attempt was made to avoid memory biases which may arise from the use of clinical records.

Significant variability was found in the individual elements of the scale, particularly in medical intervention and respiratory frequency and difficulty where agreement between the parents and the HCW was found to be slight or fair. When assessing respiratory rate, measurements should ideally be taken for 60 seconds and with a calm patient. In the case of children in an emergency room, this may be difficult to assess (18). Moreover, at younger ages, it can be more complex to assess as it varies based on the patient's own conditions (fever, crying, pain, hunger, and anxiety from being in an unfamiliar environment) (19). Other studies have shown poor agreement between parents and HCW regarding detection of respiratory distress with kappa values between 0.26 and 0.36 (20). We believe another way of measuring signs of respiratory distress such as frequent reassessments (every 3 hours) may make it easier to identify an abnormal respiratory pattern. Up to 7% of patients may develop intercostal retractions during periodic monitoring (21). Other authors have used automatic respiratory rate counters; however, they are not universally available and require cost-effectiveness studies. (22,23). It has also been previously shown that the sensitivity and

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

specificity of caregivers is insufficient to recognize tachypnea and signs of respiratory distress in respiratory diseases and pneumonia (24).

On the subject of medical intervention, some parents chose no treatment in our study and that caused serious disagreement. When the original scale was evaluated, it was used before discharge. In our study, the parents were asked to complete the scale at the emergency room (to avoid any memory bias) right after medical evaluation was done and a course of action was defined. Three observers filled it out at the same time to ensure that they were evaluating the same conditions instead of conditions that had changed. New studies should evaluate whether this scale requires any prior training (prior to using it) or a specific guide that explains how to score individual points in greater detail on the scale in the parents' version. Other factors included in the study was the best time to ask parents to fill out the scale, their level of education, and the perceptions of parents and patients. Some parents do not consider being evaluated by a physician as some kind of medical "intervention," despite the act being described in the original ReSVinet Scale.

Agreement regarding the item 'general condition' was fair, but there was significant variability in the score. The explanation may be that the sample used was mainly for upper respiratory infection, and parents could overestimate their scores and lose objectivity when going to the emergency room (25,26). General condition is subjective and varies between parents and medical examiners since going from home to a hospital environment may cause changes in their comfort, state of mind, (calm, irritable, scared), their well-being (normal, feverish or sick). Therefore, it will be necessary to try to standardize these conditions when examining patients. It has been shown that there is a growing tendency to visit pediatric emergency rooms for reasons such as perceived severity of symptoms, the availability of

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

continuous care that allows for assessment within a short period of time, and the perceived benefit of having been assessed by a pediatrician (11,27).

There was better agreement regarding feeding intolerance, and almost perfect agreement regarding fever. This is because both are easy to measure objectively since they are quite clear on the scale for parental use, thermometers are widely available in our environment, and even the detection of fever by palpation has showed suitable sensitivity – 88% (95% CI 79% - 93%) (28, 29).

Cronbach's alpha was low and a possible theory for this is that it could be a result of assessing different respiratory diagnoses. Since the initial design was only for bronchiolitis, the result may be lower when various diseases with different symptoms are assessed. However, a larger sample of all diseases would be required to determine that. A universal scale for all ARIs is, in our opinion, a far better option than individual scales for each respiratory disease, since the literature shows that most scales that comply with Cornbach's alpha requirements are homogeneous, and that they assess patients suffering from only one specific cause of respiratory distress.

Regarding the lower agreement with parents, several variables may explain these findings: a) parents' expectations from the point of view of the healthcare setting where patients were recruited (the original study was done with hospitalized patients (15) while this study was done in the emergency room); b) the higher percentage of rhinopharyngitis in this study vs bronchiolitis in the original study (10); and c) Bogota's high altitude (2600 meters above sea level) can change the perception of symptoms, but this has not been carefully studied (28, 29).

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

One limitation in the study is that only three patients were diagnosed with pneumonia. Pneumonia is a leading cause of death in developing countries. Therefore, it would be relevant to have a representative sample of this condition. Another limitation is the low number of patients admitted to the PICU. Finally, another possible bias is the inclusion of families with mandatory insurance and only those that speak Spanish. If avoidable deaths in infants are to be reduced, improved access to healthcare services must be a priority (23). The results of this study give rise to new hypotheses for studies designed to validate individual elements of the ReSVinet scale that may be easy for parents to complete. Additional studies involving lower respiratory tract infections are also needed.

CONCLUSION

The ReSVinet scale was found to have substantial reliability when used by HCW in the pediatric emergency area to assess ARI. In our population, agreement between scoring by HCW and that done by parents was moderate, and slight agreement was found for medical intervention and respiratory rate. The scale has been shown to be promising and reliable when used by healthcare personnel to assess the severity of acute respiratory infection in children under 2 years of age. Future studies should focus on finding ways to enable parents to use it reliability for two individual items so that it can be used in the emergency room.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

REFERENCES

1. Piedimonte G, Perez MK. Respiratory syncytial virus infection and bronchiolitis. Pediatr Rev. 2014;35(12):519-30.

2. Collaborators GS. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2018;392(10159):2091-138.

3. Rodríguez-Martínez CE, Rodríguez DA, Nino G. Respiratory syncytial virus, adenoviruses, and mixed acute lower respiratory infections in children in a developing country. J Med Virol. 2015;87(5):774-81.

4. Bordley WC, Viswanathan M, King VJ, Sutton SF, Jackman AM, Sterling L, et al. Diagnosis and testing in bronchiolitis: a systematic review. Arch Pediatr Adolesc Med. 2004;158(2):119-26.

5. Doan Q, Enarson P, Kissoon N, Klassen TP, Johnson DW. Rapid viral diagnosis for acute febrile respiratory illness in children in the Emergency Department. Cochrane Database Syst Rev. 2014(9):CD006452.

6. Ralston SL, Lieberthal AS, Meissner HC, Alverson BK, Baley JE, Gadomski AM, et al. Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis. Pediatrics. 2014;134(5):e1474.

7. Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT. Child and Adolescent Health and Development: Realizing Neglected Potential. In: Bundy DAP, de Silva N, Horton Su, Patton GC, Schultz L, Jamison DT, editors. Child and Adolescent Health and Development. 3rd ed. Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2017.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

8. Rashid SF, Hadi A, Afsana K, Begum SA. Acute respiratory infections in rural Bangladesh: cultural understandings, practices and the role of mothers and community health volunteers. Trop Med Int Health. 2001;6(4):249-55.

9. Hildenwall H, Rutebemberwa E, Nsabagasani X, Pariyo G, Tomson G, Peterson S. Local illness concepts--implications for management of childhood pneumonia in eastern Uganda. Acta Trop. 2007;101(3):217-24.

10. Bham SQ, Saeed F, Shah MA. Knowledge, Attitude and Practice of mothers on acute respiratory infection in children under five years. Pak J Med Sci. 2016;32(6):1557-61.

11. Kua PH, Wu L, Ong EL, Lim ZY, Yiew JL, Thia XH, et al. Understanding decisions leading to nonurgent visits to the paediatric emergency department: caregivers' perspectives. Singapore Med J. 2016;57(6):314-9.

12. Rodriguez-Martinez CE, Sossa-Briceño MP, Nino G. Systematic review of instruments aimed at evaluating the severity of bronchiolitis. Paediatr Respir Rev. 2018;25:43-57.

13. Destino L, Weisgerber MC, Soung P, Bakalarski D, Yan K, Rehborg R, et al. Validity of respiratory scores in bronchiolitis. Hosp Pediatr. 2012;2(4):202-9.

14. Bekhof J, Reimink R, Brand PL. Systematic review: insufficient validation of clinical scores for the assessment of acute dyspnoea in wheezing children. Paediatr Respir Rev. 2014;15(1):98-112.

15. Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS One. 2016;11(6):e0157665. https://doi.org/10.1371/journal.pone.0157665. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157665

16. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

17. Kou M, Hwang V, Ramkellawan N. Bronchiolitis: From Practice Guideline to Clinical Practice. Emerg Med Clin North Am. 2018;36(2):275-86.

18. Muro F, Mtove G, Mosha N, et al. Effect of context on respiratory rate measurement in identifying non-severe pneumonia in African children. Trop Med Int Health. 2015;20(6):757-765

19. Simoes EA, Roark R, Berman S, Esler LL, Murphy J. Respiratory rate: measurement of variability over time and accuracy at different counting periods. Arch Dis Child. 1991;66(10):1199-1203

20. Kahigwa E, Schellenberg D, Schellenberg JA, Aponte JJ, Alonso PL, Menendez C. Inter-observer variation in the assessment of clinical signs in sick Tanzanian children. Trans R Soc Trop Med Hyg 2002: 96: 162–166.

21. Lenahan JL, Nkwopara E, Phiri M, Mvalo T, Couasnon MT, Turner K, et al. Repeat assessment of examination signs among children in Malawi with fast-breathing pneumonia. ERJ Open Res. 2020;6(2):00275-2019

22. Källander K, Ward C, Smith H, Bhattarai R, Kc A, Timsina D et al. Usability and acceptability of an automated respiratory rate counter to assess childhood pneumonia in Nepal. Acta Paediatr. 2020;109(6):1207-1220

23 Ward C, Baker K, Marks S, Getachew D, Habte T, McWhorter C et al. Determining the Agreement Between an Automated Respiratory Rate Counter and a Reference Standard for Detecting Symptoms of Pneumonia in Children: Protocol for a Cross-Sectional Study in Ethiopia. JMIR Res Protoc. 2020;9(4):e16531

24. Geldsetzer P, Williams TC, Kirolos A, Mitchell S, Ratcliffe LA, Kohli-Lynch MK, et al. The recognition of and care seeking behaviour for childhood illness in developing countries: a systematic review. PLoS One. 2014;9(4):e93427.

25. Feudtner C, Walter JK, Faerber JA, Hill DL, Carroll KW, Mollen CJ, et al. Good-Parent beliefs of Parents of seriously ill children. JAMA Pediatr. 2015;169(1):39-47.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

26. Kubicek K, Liu D, Beaudin C, Supan J, Weiss G, Lu Y, et al. A profile of nonurgent emergency department use in an urban pediatric hospital. Pediatr Emerg Care. 2012;28(10):977-84.

27. Muhe L. Mothers' perceptions of signs and symptoms of acute respiratory infections in their children and their assessment of severity in an urban community of Ethiopia. Ann Trop Paediatr. 1996;16(2):129-35.

28. Hutter D. "Up to which altitude above sea level a potential risk of hypoxia is negligible for infants? Under which circumstances?". Paeditrica. 2006;17(1):49-51.

29. Muro F, Meta J, Renju J, Mushi A, Mbakilwa H, Olomi R, et al. "It is good to take her early to the doctor" - mothers' understanding of childhood pneumonia symptoms and health care seeking in Kilimanjaro region, Tanzania. BMC Int Health Hum Rights. 2017;17(1):27.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 1. ReSVinet scale

Item	0 points	1 points	2 points	3 points
1 Feeding intolerance	No	Mild Decreased appetite and/or isolated vomits with cough.	Partial Frequent vomits with cough, rejected feed but able to tolerate fluids sufficiently to ensure hydration	Total Oral intolerance or absolute rejection of oral feed, not able to guarantee adequate hydration orally. Required nasogastric and/or intravenous fluids
2 Medical intervention	No	Basic Nasal secretions aspiration, physical examination, trial of nebulized bronchodilators, antipyretics.	Intermediate Oxygen therapy required. Complementary exams were needed (chest X-rays, blood gases, hematimetry...). Maintained nebulized therapy with bronchodilators.	High Required respiratory support with positive pressure (either non-invasive in CPAP, BiPAP or high-flow O2; or invasive through endotracheal tube).
3 Respiratory difficulty	No	Mild Not in basal situation but does not appear severe. Wheezing only audible with stethoscope, good air entrance. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates mild severity.	Moderate Makes some extra respiratory effort (intercostal and/or tracheosternal retraction). Presented expiratory wheezing audible even without stethoscope, and air entrance may be decreased in localized areas. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates moderate severity	Severe Respiratory effort is obvious. Inspiratory and expiratory wheezing and/or clearly decreased air entry. If modified Wood Downes, Wang score or any other respiratory distress score is applied, it indicates high severity.
4 Respiratory frequency	*Normal < 2 m: 40–50 bpm 2–6 m: 35–45 bpm 6-12m: 30–40 bpm 12-24m:25–35 bpm 24-36m: 20–30 bpm	Mild or occasional tachypnea Presented episodes of tachypnea, well tolerated, limited in time by self-resolution or response to secretion aspiration or nebulization	Prolonged or recurrent tachypnea Tachypnea persisted or recurred despite secretion aspiration and/or nebulization with bronchodilators	Severe alteration Severe and sustained tachypnea. Very superficial and quick breath rate. Normal/low breath rate with obvious increased respiratory effort and/or mental status affected. Orientative rates of severe tachypnea: < 2 m: > 70 bpm 2–6 m: > 60 bpm 6-12m: >55 bpm 12-24m: >50 bpm 24- 36m: >40 bpm
5 Apnea	No			Yes At least one episode of respiratory pause medically documented or strongly suggested through anamnesis.
6 General Condition	Normal	Mild Not in basal situation, child was mildly uncomfortable but does not appear to be in a severe condition, not impress of severity. Parents are not alarmed. Could wait in the waiting room or even stay at home	Moderate Patient looks ill, and will need medical exam and eventually further complementary exams and/ or therapy. Parents are concerned. Cannot wait in the waiting room	Severe Agitated, apathetic, lethargic. No need of medical training to realize severity. Parents are very concerned. Immediate medical evaluation and/or intervention were required.
7 Fever	No	Yes, mild Central T < 38.5°C	Yes, moderate Central T > 38.5°C	

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

* (m = months)

+ the original article also contains the version for parents

Reproduce from: Justicia-Grande AJ, Pardo-Seco J, Cebey-López M, Vilanova-Trillo L, Gómez-Carballa A, Rivero-Calle I, et al. (2016) Development and Validation of a New Clinical Scale for Infants with Acute Respiratory Infection: The ReSVinet Scale. PLoS ONE 11(6): e0157665. https://doi.org/10.1371/journal.pone.0157665.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 2. Clinical and demographic characteristics

VARIABLE	**Total n=188**
	n (%)
Age in months, median (IQR)	10 (4.5 - 16)
0-3 months	40 (21.3)
4-12	66 (35.1)
>12 months	82 (43.6)
Gender, male	110 (58.5)
Diagnosis	
Rhinopharyngitis	76 (40.4)
Bronchiolitis	54 (28.7)
Croup	32 (17.1)
Wheezing	23 (12.2)
Pneumonia	3 (1.6)
Time from first symptoms, median (IQR)	3.5 (2 – 7)
1 to 7 days	143 (76)
8 to 14 days	24 (12.8)
15 to 30 days	21 (11.2)
Treatment decision	
Discharged	66 (35.1)
Short-term Observation (< 24 hours)	67 (35.6)
Hospital admission	55 (29.3)
Viral isolation tested	58 (30.8)
Negative	35 (18.6)
RSV	17 (9)
Adenovirus	3 (1.6)
Parainfluenza 1	2 (1.1)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Adenovirus and RSV	1 (0.5)
Length of stay in days, median (IQR)	3 (2 – 5)
0 to 7 days	178 (94.7)
8 to14 days	8 (4.3)
15 to 30 days	2 (1)
Antibiotic prescribed	9 (4.8)
PICU admission	5 (2.7)
30-day mortality, n= 182	0
Return visit before 10 days	25(13.3)
Discharged	10 (5.3)
Short-term Observation (<24 hours)	15 (7.9)
Hospital admission	0

IQR: interquartile range; n: absolute number or decimal. % percentage; RSV: respiratory syncytial virus; PICU: Pediatric intensive care unit.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Table 3. Interobserver agreement for each item on the scale (weighted Kappa coefficient)

Item	Faculty vs Resident (95% IC)	Faculty vs Parent (95% IC)	Resident vs Parent (95% IC)
Feeding intolerance	0.72 (0.64 – 0.77) Substantial	0.45 (0.42 – 0.49) Moderate	0.44 (0.35 – 0.46) Moderate
Medical intervention	0.88 (0.82 – 0.89) Almost perfect	0.07 (0.00 -0.12) Slight	0.26 (0.23 – 0.32) Fair
Respiratory difficulty	0.76 (0.73 – 0.85) Substantial	0.28 (0.22-0.36) Fair	0.26 (0.23 – 0.35) Fair
Respiratory frequency	0.86 (0.74 – 0.91) Almost perfect	0.08 (0.02 – 0.13) Slight	0.08 (0.05 – 0.17) Slight
Apnea	*	*	*
General condition	0.76 (0.71 – 0.82) Substantial	0.25 (0.25 – 0.30) Fair	0.34 (0.28 – 0.37) Fair
Fever	0.99 (0.99 – 1) Almost perfect	0.82 (0.74 – 0.88) Almost perfect	0.82 (0.78 – 0.87) Almost perfect
TOTAL	0.78 (0.76 – 0.80) Substantial	0.41 (0.36 – 0.47) Moderate	0.41 (0.32 – 0.49) Moderate

* Was not scored due to non-occurrence of symptom within observation period of the Faculty or Resident group.

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 1. ReSVinet scale percentage by item

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 2. Scatter and Fitted Plot of ReSVinet score: faculty vs. parent

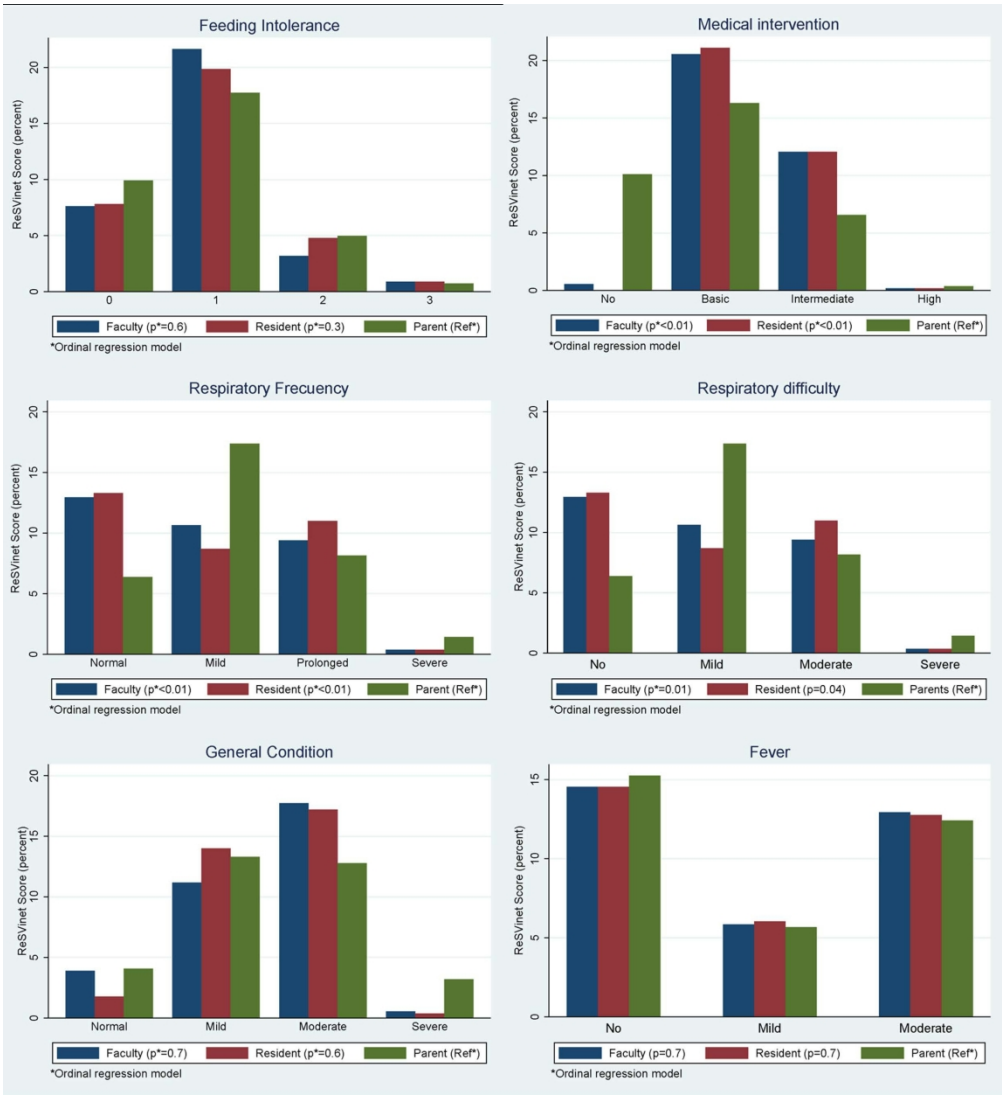
bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

Figure 3. Scatter and Fitted Plot of ReSVinet score: resident vs. parent

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.

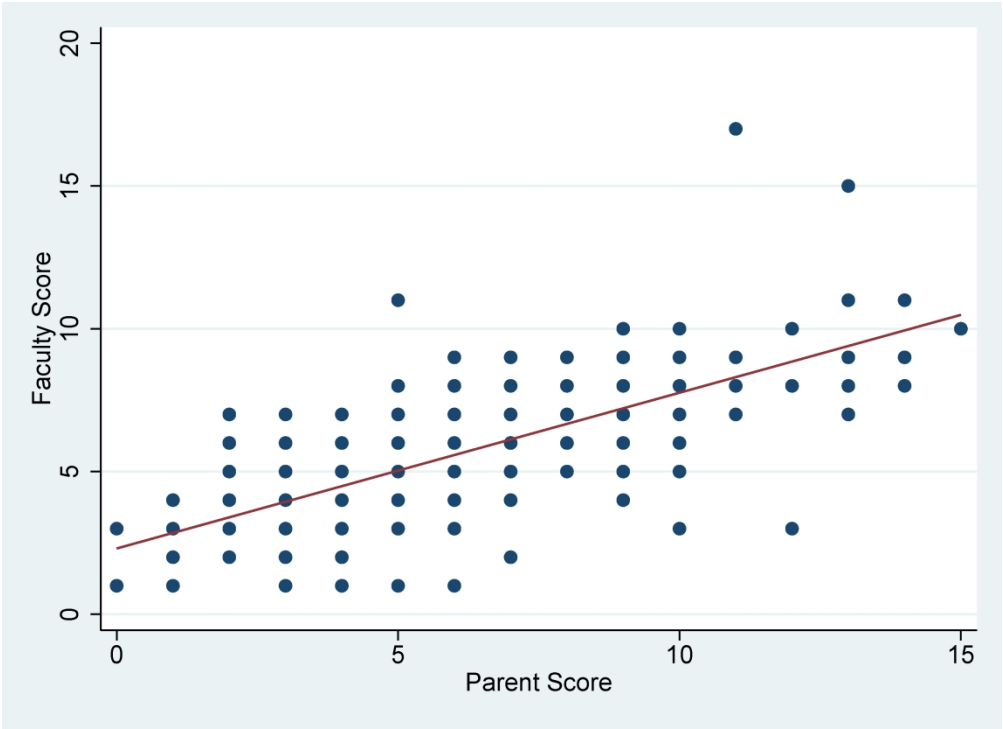
Figure 4. Scatter and Fitted Plot of ReSVinet score: faculty vs. resident

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



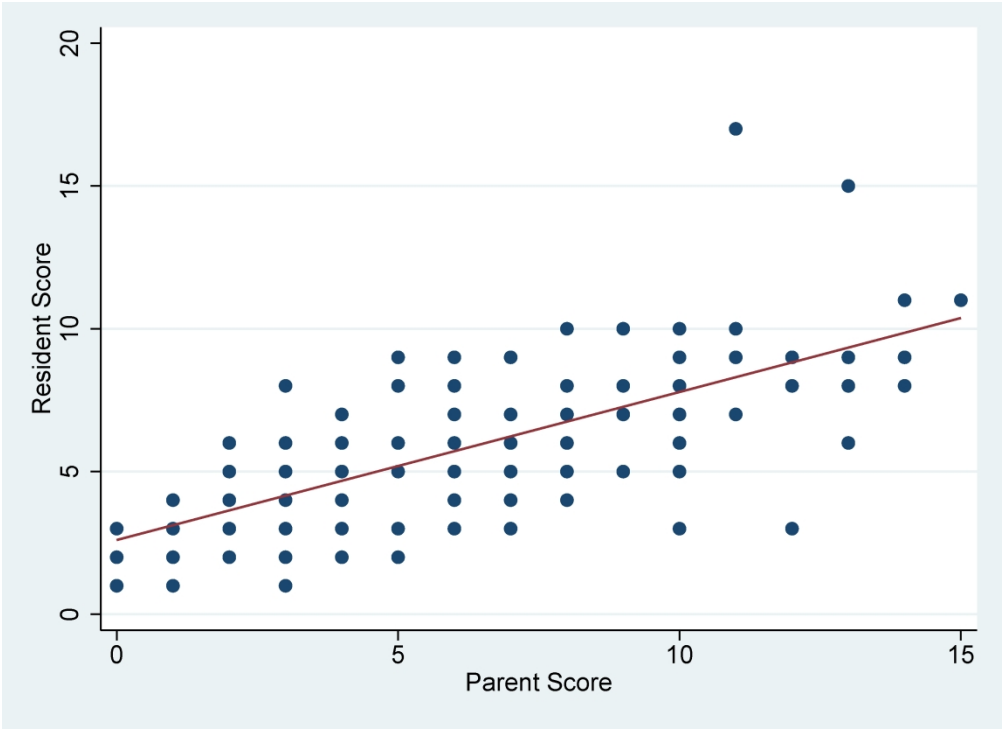
2117x2309mm (72 x 72 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



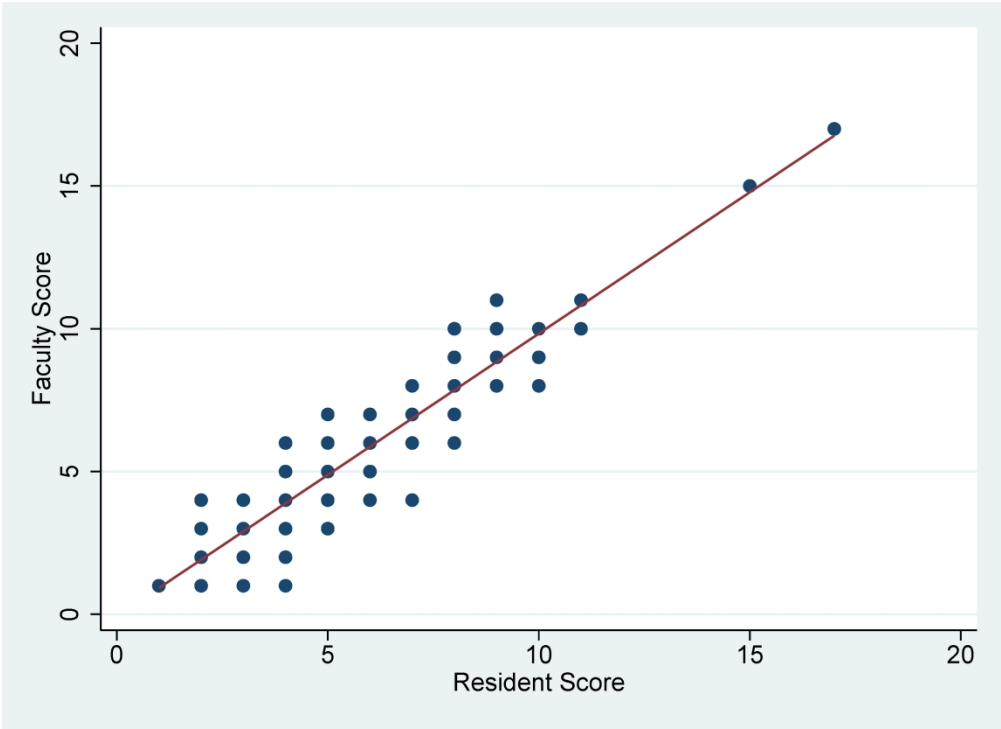
139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.



139x101mm (600 x 600 DPI)

bmjpo: first published as 10.1136/bmjpo-2020-000966 on 28 May 2021. Downloaded from http://bmjpaedsopen.bmj.com/ on April 18, 2024 by guest. Protected by copyright.