Table 1 Total episodes of infection and episodes of invasive bacterial infection documented in the paediatric emergency department before and during the SARS-CoV-2 pandemic.

	Episodes in the PED	Episodes/month	IBIs	IBIs/month	IBI/episodes	Most prevalent bacteria (%)
Prepandemic	153 736	4270	70	1.94	1 IBI/2196	*S. pneumoniae* (18.6%) *N. meningitidis* (18.6%) *S. aureus* (17.1%) *E. coli* (15.7%) *S. agalactiae* (5.7%)
Pandemic						
2020	21 746	2175	19	1.90	1 IBI/1144*	*S. pneumoniae* (28.6%) *S. aureus* (20.4%) *N. meningitidis* (10%)
2021	39 880	3323	8	0.67*	1 IBI/4985*	*S. agalactiae* (10%)
2022	53 743	4478	22	1.83	1 IBI/2443	*E. coli* (10%)

IBI, invasive bacterial infection; PED, paediatric emergency department.
During the pandemic, the salient changes in the causative bacteria were the disappearance of *N. meningitidis* in 2021 and the increased frequency of *S. pneumoniae* in 2022 (9/22; 40.9% of total diagnosed IBIs).
In infants aged less than 3 months, *S. agalactiae* was the leading causative agent of IBI during the pandemic (33.3%) compared to *E. coli* (50%) in the prepandemic period.
* $P < .01$, compared to the prepandemic period.

pared for the potential emergence of a situation similar to the one experienced during the pandemic.

Funding

This research did not receive any external funding.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Garazi Martin-Irazabal, Iker Gangoiti, Borja Gomez, Libe Lizarraga, Santiago Mintegi*

Servicio de Urgencias de Pediatría, Hospital Universitario Cruces; Instituto de Investigación Sanitaria Biocruces Bizkaia, Universidad del País Vasco, UPV/EHU, Baracaldo (País Vasco), Spain

* Corresponding author.
E-mail address: santiago.mintegi@osakidetza.eus (S. Mintegi).

https://doi.org/10.1016/j.anpede.2023.01.013
2341-2879/

Validity of CEEW equations for weight estimation in Spanish paediatric patients

Validez de las ecuaciones CEEW para la estimación de peso en pacientes pediátricos españoles

Dear Editor:

The calculation and manipulation of medication doses is not as frequent in any population as it is in the paediatric age group, so the management of paediatric emergency care episodes is a veritable challenge for health care providers. Knowing the exact weight of the paediatric patient is important, as dose calculations depend on this measure, but this information is not always readily available.

To solve this problem, various methods for weight estimation based on indirect measurements have been used historically, but practically all have limited validity due to the variation inherent in ethnic, biological and sociodemographic factors.[1,2]

Among the most recently developed weight estimation strategies are the Children's European Estimator of

Table 1 Weight estimation using the CEEW1 and CEEW2 equations.

	1−11 meses (n = 120)	1−5 years (n = 133)	6−10 years (n = 138)	11−14 years (n = 124)	Total (n = 515)
CEEW1 equation: ln (weight) = 0.0151222388 × age − 0.0011458885 × age^2 + 0.2967431897 × AC − 0.0104572693 × AC^2 + 0.0001381567 × AC^3 + 0.0149652312 × height − 1.4955305740					
ICC (*P*)	0.903 (*P* < .001)	0.966 (*P* < .001)	0.903 (*P* < .001)	0.916 (*P* < .001)	0.984 (*P* < .001)
Difference in means (95% LA)	−0.12 (−1.57−1.33)	−0.47 (−2.97−2.02)	−0.87 (−8.03−6.29)	−0.74 (−10.33−8.84)	−0.56 (−6.73−5.6)
Cases with error <10%, n (%; 95% CI)	99 (82.5%; 75.7−89.3)	108 (81.2%; 74.5−87.8)	101 (73.2%; 65.8−80.5)	89 (71.7%; 63.8−79.7)	397 (77.1%; 73.46−80.7)
Cases with error <20%, n (%; 95% CI)	116 (96.6%; 93.4−99.8)	128 (96.2%; 93−99.4)	131 (94.9%; 91.2−98.5)	123 (99.2%; 97.6−100)	498 (96.7%; 95.1−98.2)
CEEW2 equation: ln (weight) = 0.1443608977 × age − 0.0040395021 × age^2 + 0.4223311859 × AC − 0.0148641297 × AC^2 + 0.0001923541 × AC^3 + 0.0258703205 × sex − 1.6251030158					
ICC (*P*)	0.963 (*P* < .001)	0.849 (*P* < .001)	0.681 (*P* < .001)	0.843 (*P* < .001)	0.834 (*P* < .001)
Difference in means (95% LA)	−0.12 (−1.98−1.72)	−2.10 (−8.68−4.46)	−1.52 (−10.32−7.27)	−4.51 (−17.01−7.99)	−2.06 (−10.96−6.83)
Cases with error <10%, n (%; 95% CI)	85 (70.8%; 62.7−79)	55 (41.3%; 33−49.7)	95 (68.8%; 61.1−76.5)	67 (54%; 45.2−62.81)	302 (58.6%; 54.4−62.9)
Cases with error <20%, n (%; 95% CI)	112 (93.3%; 88.9−97.8)	113 (85%; 78.9−91)	123 (89.1%; 83.9−94.3)	111 (89.5%; 84.1−94.9)	459 (89.1%; 86.4−91.8)

CI, confidence interval; ICC, interclass correlation coefficient; LA, limits of agreement.

Weight (CEEW) equations. The CEEW1 equation estimates the weight based on height, age and arm circumference and the CEEW2 equation based on sex, age and arm circumference. They are two complex equations developed in Europe and validated in 3 countries (United Kingdom, Greece and Netherlands), found to perform substantially better in comparison to other instruments used more widely, thus offering a more accurate and safer method.[3]

The aim of our study was to assess the validity of the CEEW equations for weight estimation in the Spanish paediatric population.

We conducted a prospective observational study in patients managed in the paediatric emergency departments of 2 hospitals in the Basque Country (Spain), recruited through convenience sampling between January and July 2018. The inclusion criteria were age 1 month to 14 years (as this is the age range to which most weight estimation strategies apply) and priority level III, IV or V (Manchester Triage system). We excluded patients whose clinical condition interfered with the study protocol or patients who refused to participate. For all included patients, we collected their age and sex and height, arm circumference and weight measurements. The study design adhered to the principles of the Declaration of Helsinki and was approved by the Research Ethics Committee of the Basque Country, and participation was contingent on the informed consent of the parents or legal guardians.

To assess the performance of the CEEW equations, we calculated the proportion of estimates with a prediction error of less than 10% (PE10) and 20% (PE20) relative to the actual weight. We assessed the concordance between estimated and actual weight values by means of the interclass correlation coefficient and calculated the difference in means between both measures along with the 95% limits of agreement.

The statistical analysis of the data was performed with the software IBM-SPSS version 26, considering results statistically significant if *P* was less than 0.05.

A total of 515 paediatric patients participated in the study. The characteristics of the sample and anthropometric data for the patients were described in a previous study.[1] Female patients amounted to 47.4% of the sample, and the median age was 6 years (interquartile range, 1−10).

The agreement of the weight estimates obtained with both equations with the actual weight was excellent (Table 1). However, the overall prediction error was lower for the CEEW1 equation compared to the CEEW2 (77.1% of total estimates with PE10 and 96.7% with PE20 vs 58.6% with PE10 and 89.1% with PE20, respectively). When we compared the prediction error by age group, we found a less consistent performance with the CEEW2 equation.

The results of our study in terms of the predicted error proportions in weight estimates were practically identical to those reported in the original study, developed in geographical areas different from Spain.

Although there is no standard criterion that determines the maximum error that can be allowed in a weight estimation tool to be considered valid, the most stringent authors[2,4] have applied validity thresholds of at least 70% of estimates with a PE10 and at least 95% of estimates with a PE20. Applying these criteria, the CEEW1 equation could be considered valid for safe application in the Spanish paediatric population. However, the CEEW2 equation would not meet this quality standard.

Pending other studies with larger samples or in other communities, our findings suggest that the CEEW1 equation may replace other estimation formulas in clinical practice that are more popular but the validity of which has come to be questioned(such as the APLS or ERC equations).[5] But the use of the CEEW1 equation in practice is not simple, as it requires a specific mobile app (resolving the

equation is complicated) and the obtention of some anthropometric parameters that may be somewhat difficult in out-of-hospital care settings, such as the arm circumference. In any case, it is a tool that should be considered, given the dearth of strategies for paediatric weight estimation validated in the Spanish population

Conflicts of interest

The authors have no conflicts of interest to declare.

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Garbiñe Pérez-Llarena[a], Leyre Gravina-Alfonso[b,c], Sendoa Ballesteros-Peña[b,c,d,*]

[a] *Servicio de Urgencias Pediátricas, Hospital de Cruces, Barakaldo, Spain*
[b] *Biocruces Bizkaia Health Research Institute, Barakaldo, Spain*
[c] *Facultad de Medicina y Enfermería, Universidad del País Vasco/Euskal Herriko Unibertsitatea, Leioa, Spain*
[d] *Dirección de Enfermería, Hospital Santa Marina, Bilbao, Spain*

* Corresponding author.
E-mail address: sendoa.ballesteros@ehu.eus
(S. Ballesteros-Peña).

https://doi.org/10.1016/j.anpede.2022.12.003
2341-2879/