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Técnica inhalatoria: De la teoría a la práctica

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Esta presentación está destinada únicamente a fines educativos.

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Conflictos de interés

He sido speaker de:

- Laboratorios Abbott
- PowerBreathe

Introducción

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Más de la mitad de los niños que usan IDM sin aerocámara **obtienen poco o ningún beneficio clínico** de su medicación

Los pacientes con una técnica de inhalación incorrecta tienen más probabilidades de tener un **asma mal controlada**, lo que se asocia con un **aumento de las exacerbaciones** y la utilización de la atención médica.

Volerman A, et al. Mask Use with Spacers/Valved Holding Chambers and Metered Dose Inhalers among Children with Asthma. Ann Am Thorac Soc. 2021 Jan;18(1):17-22.

Introducción

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Las personas que hacen un mal uso del inhalador también pueden perder la confianza en su tratamiento y tener un **cumplimiento deficiente**, lo que contribuye a la morbilidad del asma.

Costo del uso indebido de los inhaladores se estima entre **7.000 y 15.000 millones de dólares.**

Volerman A, et al. Mask Use with Spacers/Valved Holding Chambers and Metered Dose Inhalers among Children with Asthma. Ann Am Thorac Soc. 2021 Jan;18(1):17-22.

Introducción – Principales errores

No agitar (34,2%)

Fallo en la conexión con espaciador/aerocámara (78,1%)

Falla en la exhalación previa (65,5%)

Fallo en el selle bucal (7,4%)

Cho-Reyes S, et al. Inhalation Technique Errors with Metered-Dose Inhalers Among Patients with Obstructive Lung Diseases: A Systematic Review and Meta-Analysis of U.S. Studies. Chronic Obstr Pulm Dis. 2019 Jul 24;6(3):267-280.

Introducción – Principales errores

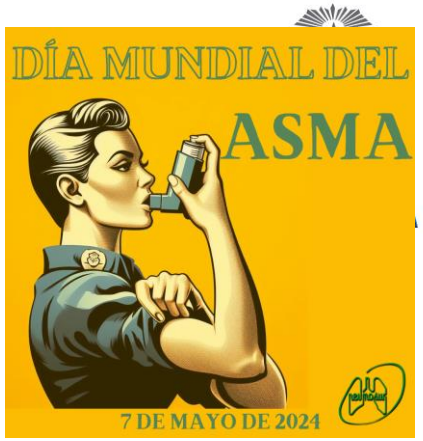
Inhalación muy rápida (39,4%)

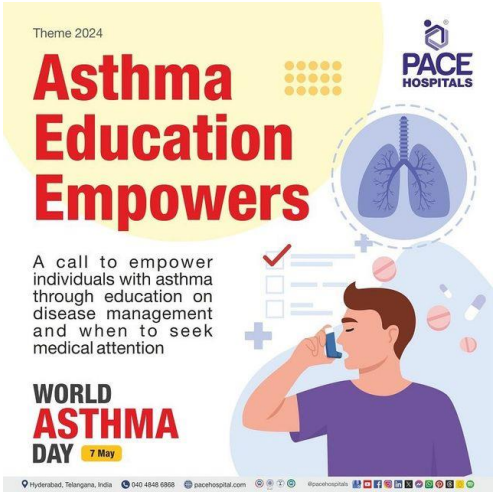
Fallo en pausa inspiratoria (41,9%)

Falla en exhalar después inhalación (35,9%)

Fallo en repetir el proceso (43,2%)

Cho-Reyes S, et al. Inhalation Technique Errors with Metered-Dose Inhalers Among Patients with Obstructive Lung Diseases: A Systematic Review and Meta-Analysis of U.S. Studies. Chronic Obstr Pulm Dis. 2019 Jul 24;6(3):267-280.





¿Qué mensaje damos los profesionales?

Elección de una aerocámara

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No usar vs **espaciadores** vs **aerocámara**

Pregunta interactiva

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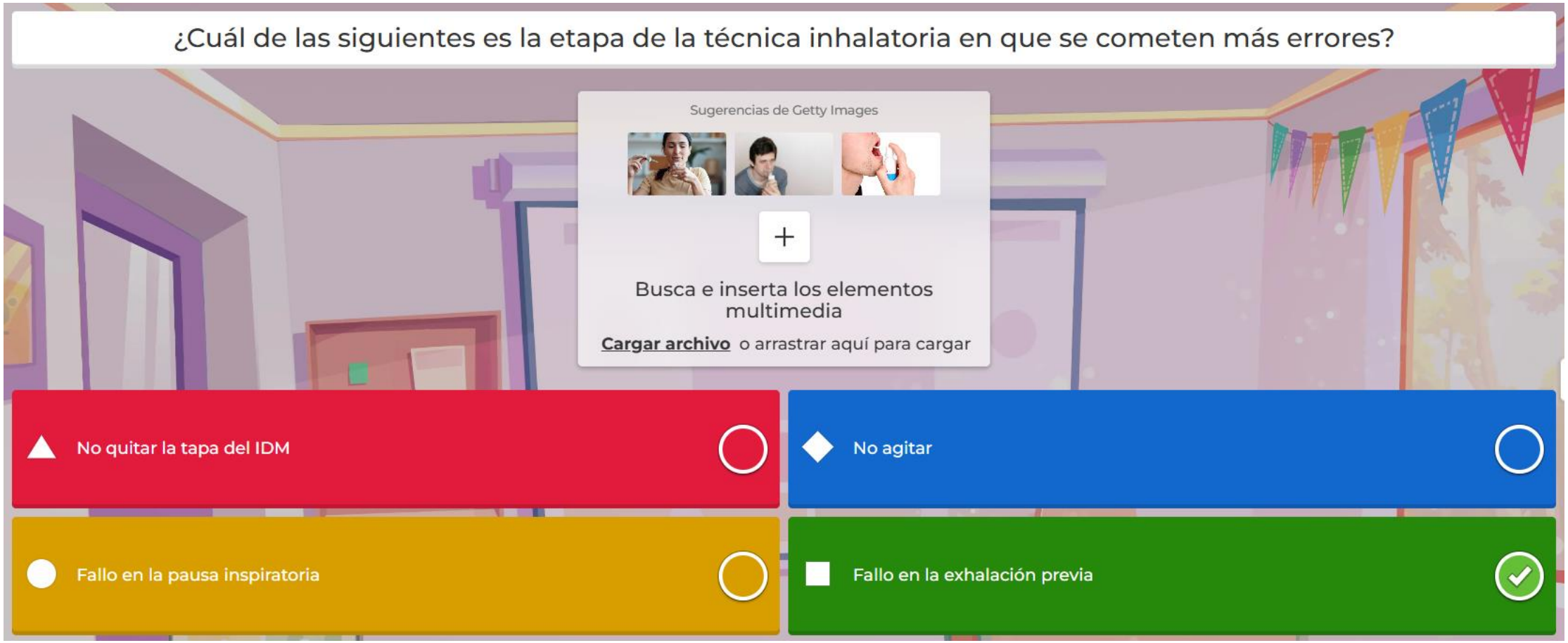

Uso de aerocámara antiestática

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Received: 25 November 2020 | Accepted: 17 March 2021
DOI: 10.1111/ijcp.14157

ORIGINAL PAPER
Therapy area: Other

THE INTERNATIONAL JOURNAL OF CLINICAL PRACTICE WILEY

Effect of different accessory devices on the dose delivered from pressurised metred-dose inhalers

Mina Nicola[1] | Raghda R. S. Hussein[1] | Youssef M. A. Soliman[2] | Mohamed Abdelrahim[1]

TABLE 1 Demographic data of healthy subjects and COPD subjects including mean (standard deviation) of age, weight, height and predicted FEV1% (baseline)

	Healthy subjects	COPD subjects	*P* value
Age	57.58 (17.1)	58.16 (14.86)	.78
Weight	72.91 (13.18)	74.41 (12.39)	.62
Height	168.66 (11.49)	167.58 (10.43)	.91
Predicted FEV1% (baseline)	98.43% (12.86)	54.02% (17.43)	.03

Fármaco

3 puffs de salbutamol
- nominal dose of 100 µg per puff
- CFC-free propellant HFA134a) from Ventolin pMDI (GlaxoSmithKline)

Uso de aerocámara antiestática

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con antiestática

sin antiestática

Uso de aerocámara antiestática

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TABLE 3 Total mean (SD) ug of salbutamol amount renally recovered after inhaling three puffs (100 µg each) of salbutamol after half an hour in healthy subjects (USALV0.5) and COPD subjects groups (USALP0.5)

	Tipshaler mouthpiece	Dolphin mouthpiece	Aero-chamber mouthpiece	Modified drink bottle mouthpiece	Able mouthpiece	Tipshaler face-mask	Dolphin face-mask	Aero-chamber face-mask	Modified drinkbottle face-mask	Able face-mask
USALV0.5	16.44 (2.32)	8.33 (2.70)	18.11 (3.62)	9.04 (2.92)	17.45 (4.80)	16.17 (3.08)	10.45 (2.40)	16.76 (3.24)	7.08 (2.63)	16.86 (3.87)
USALP0.5	6.26 (1.19)	4.54 (1.18)	7.41 (1.58)	3.64 (1.58)	7.02 (2.10)	6.30 (1.24)	3.99 (1.05)	6.70 (1.18)	2.36 (0.93)	6.83 (1.47)

TABLE 4 Total mean (SD) µg of salbutamol amount renally recovered after inhaling three puffs (100 µg each) of salbutamol in the first 24 hours in healthy subjects (USALV024) and COPD subjects groups (USALP24)

USAL24	Tipshaler mouthpiece	Dolphin mouthpiece	Aero-chamber mouthpiece	Modified drink bottle mouthpiece	Able mouthpiece	Tipshaler face-mask	Dolphin face-mask	Aero-chamber face-mask	Modified drink bottle face-mask	Able face-mask
USALV24	69.89 (19.38)	48.61 (16.32)	70.90 (18.82)	36.64 (12.84)	68.49 (19.62)	67.77 (10.80)	44.96 (19.41)	69.18 (12.64)	36.12 (12.16)	62.48 (13.82)
USALP24	42.90 (10.31)	31.41 (12.10)	44.94 (15.96)	21.07 (7.77)	43.15 (11.11)	43.12 (8.12)	28.16 (7.70)	43.84 (12.47)	22.94 (6.72)	42.41 (11.33)

Nicola M, et al. Effect of different accessory devices on the dose delivered from pressurised metred-dose inhalers. Int J Clin Pract. 2021 Jun;75(6):e14157.

Pregunta interactiva

¿Mascarilla o boquilla?

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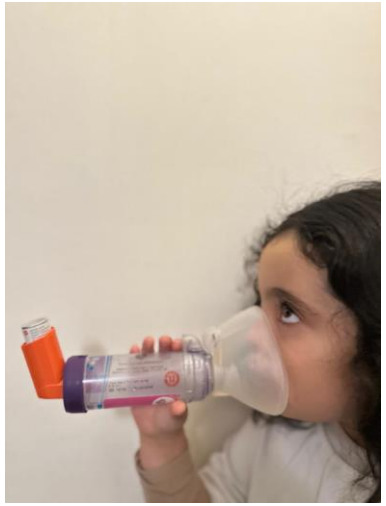
¿Menores de 4 años?

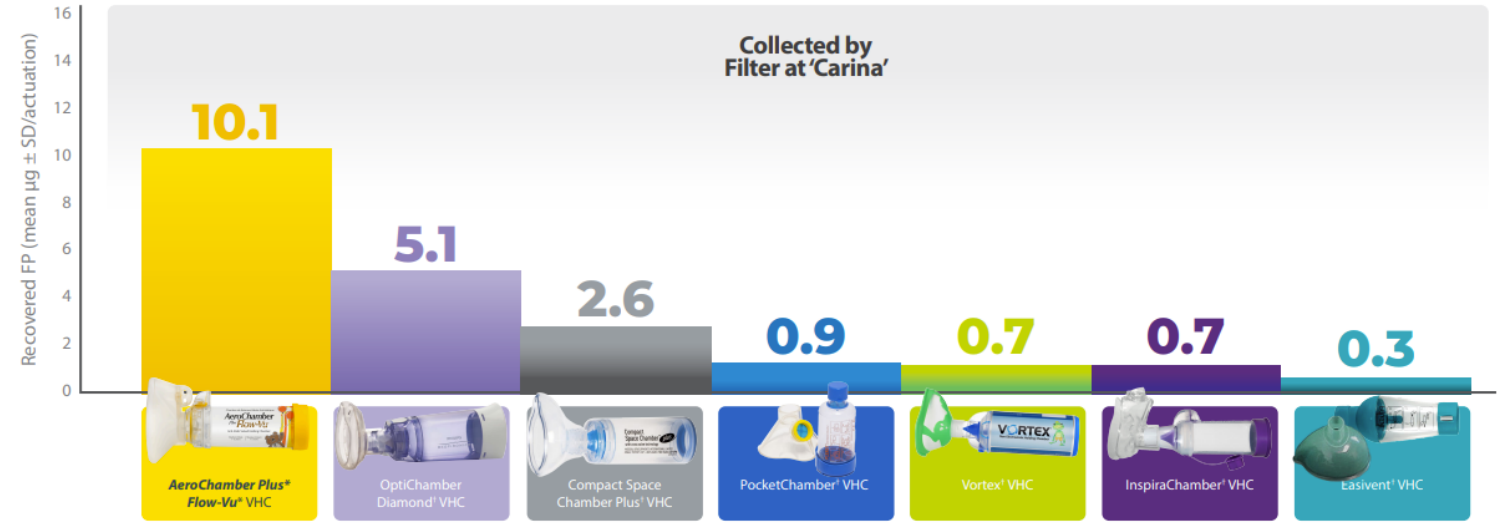


¿Mayores de 4 años?

Niños pequeños

Breathing simulator: Coordination delay of 2 s before inhalation, followed by tidal breathing (tidal volume = 155-mL, I:E ratio = 1:2, rate = 25 cycles/min).

5-actuations of Flovent 50 were delivered at 30-s intervals



	AeroChamber Plus* Flow-Vu* VHC	OptiChamber Diamond† VHC	Compact Space Chamber Plus† VHC	PocketChamber† VHC	Vortex† VHC	InspiraChamber† VHC	Easivent† VHC
Retained by Chamber	17.5±1.6	22.7±2.7	28.4±3.3	37.6±3.1	36.2±3.8	39.2±2.7	31.7 ± 5.2
Deposited Inside Facemask	1.4±0.2	3.4±0.8	0.1±0.1	0.7±0.1	0.5±0.7	1.0±0.2	0.4 ± 0.3
Deposited on Face	0.6±0.4	0.5±0.3	0.0±0.0	0.3±0.0	0.1±0.1	0.2±0.1	0.0±0.0
Deposited in Upper Airway	1.1±0.2	0.7±0.1	0.0±0.0	0.3±0.1	0.3±0.1	0.2±0.0	0.0±0.0
Collected by Filter at 'Carina'	**10.1±1.0**	**5.1±0.9**	**2.6±1.6**	**0.9±0.5**	**0.7±1.1**	**0.7±0.1**	**0.3 ± 0.2**

Nagel M, et al. Evaluation of Child-Mask Spacers Using an Oro-nasopharynx Model for the Aerosol Delivery of a Widely Prescribed Corticosteroid. ATS Congress 2024

Pregunta interactiva

Realice una inspiración con una pausa inspiratoria

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DE GRUYTER OPEN

J Biomed Clin Res Volume 9 Number 2, 2016

DOI: 10.1515/jbcr-2016-0015

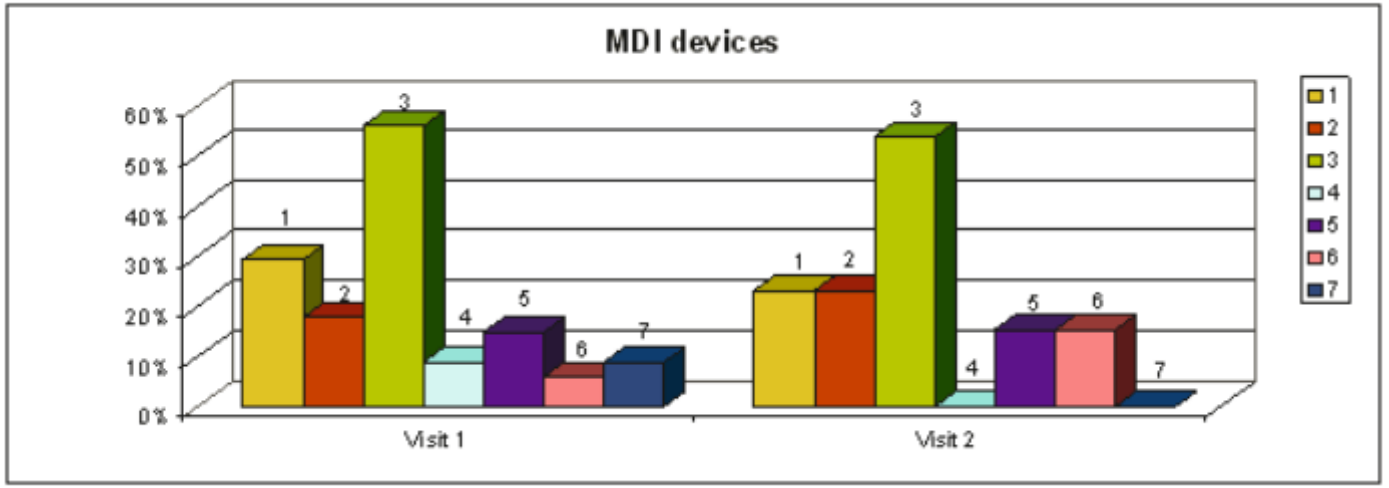
Original Article

IMPROVING THE INHALATION TECHNIQUE IN PATIENTS WITH OBSTRUCTIVE PULMONARY DISEASES

Zlatina I. Ivanova,
Nikolay H. Kyuchukov,
Iliya I. Krachunov,
Nikolay A. Yanev,
Pavlina Ts. Glogovska,
Plamen S. Pavlov,

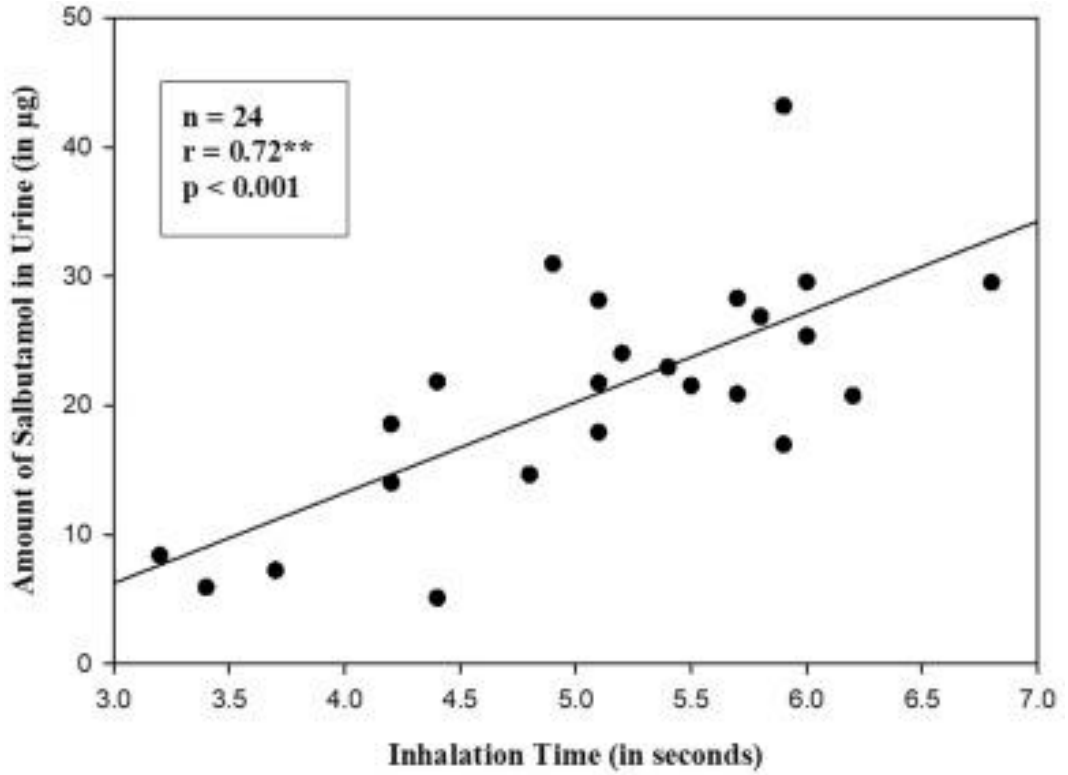
n=34 pacientes con EPOC

Summary



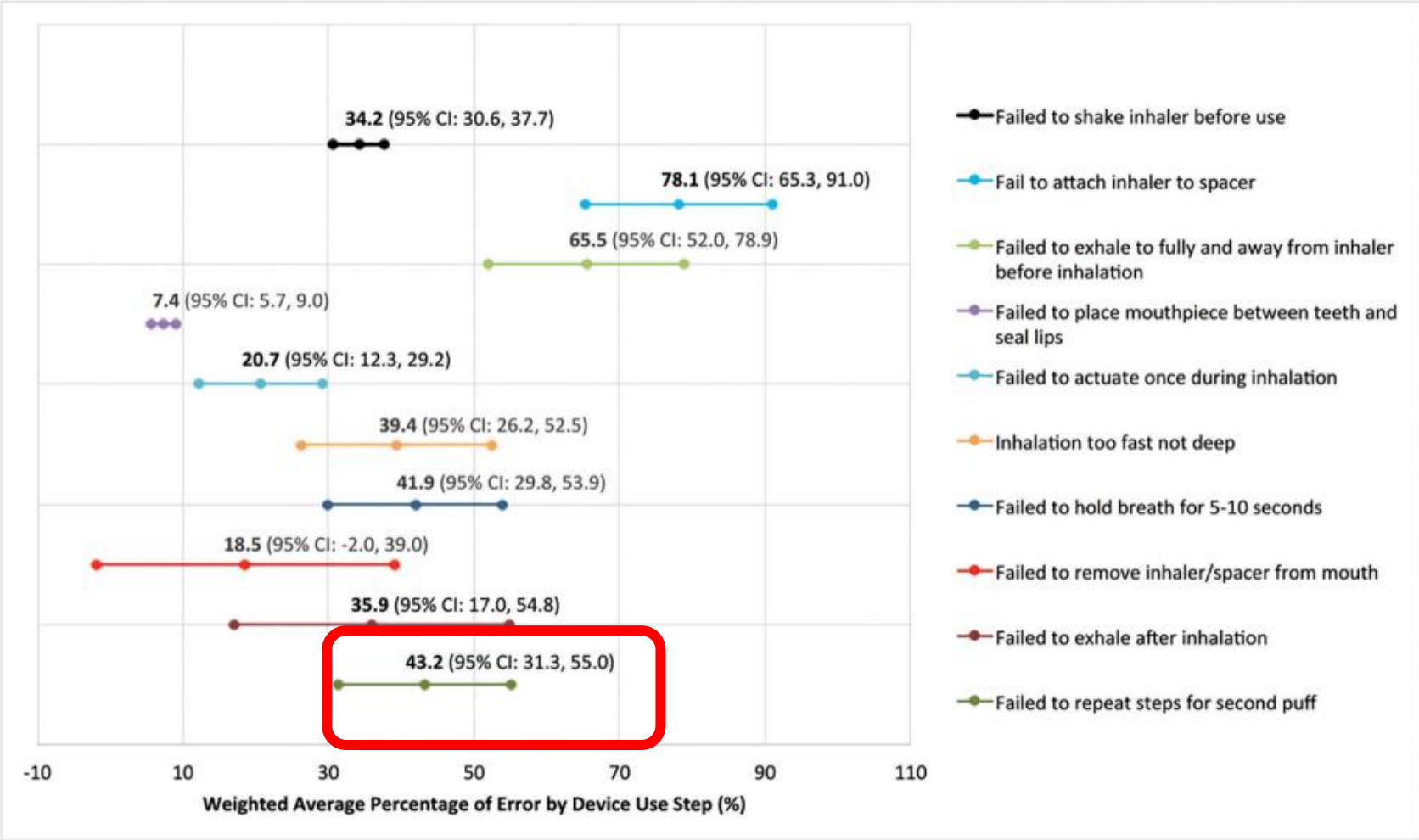
1) poor synchronization between the placebo canister activation and the inhalation; 2) not inhaling enough forcefully; 3) low duration of the inhalation; 4) not holding the breath after inhalation for at least 5 seconds; 5) not keeping the lips tightly around the mouthpiece; 6) good inhalation technique; 7) other mistakes

Realice una inspiración con una pausa inspiratoria



Sobh, AH et al. The impact of using different add-on devices to pressurized metered-dose-inhalers containing salbutamol in healthy adult volunteers: An in-vivo study. Journal of Drug Delivery Science and Technology, 2022;74:103539.

Repita el siguiente puff con las mismas indicaciones



n=1360
EPOC: 1012
Asma: 312
Otros: 36

Cho-Reyes S, et al. Inhalation Technique Errors with Metered-Dose Inhalers Among Patients with Obstructive Lung Diseases: A Systematic Review and Meta-Analysis of U.S. Studies. Chronic Obstr Pulm Dis. 2019 Jul 24;6(3):267-280.

Confirme que el paciente hace bien la técnica

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	MDI§ group n_1=34 (28%) patients	DPI* group n_2=86 (72%) patients	
Age yrs† ME‡ (min-max)	57.5 yrs (26-82)	63 yrs (26-83)	p=0.018
Bronchial asthma (54 patients)	22 (40.74%)	32 (59.26%)	p=0.012
COPD‡ (66 patients)	12 (18.18%)	54 (81.82%)	
Using spacer?			
Yes	6 (17.7%)		
No	28 (82.3%)		
Good inhalation skills according to the patients?			
Yes	33 (97%)	83 (96.5%)	
No	1 (3%)	3 (3.5%)	

†yrs - years; ‡ME - median; ǂCOPD – chronic obstructive pulmonary disease; §MDI – metered dose inhaler
*DPI – dry powder inhaler

Ivanova Z, et al. Improving the Inhalation Technique in Patients with Obstructive Pulmonary Diseases. J Biomed Clin Res Volume 9 Number 2, 2016

El lavado (y secado) de la aerocámara

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Para favorecer el lavado

1. Seguir instrucciones del fabricante
2. Ideal se pueda desmontar la aerocámara

Establezca un programa de entrenamiento

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Step 1. Remove the protective cap from mouthpiece of MDI
Step 2. Shake the MDI
Step 3. Breathe out as far as comfortable
Step 4. Place the MDI mouthpiece between the teeth and seal with lips
Step 5. Ensure your tongue does not obstruct the mouthpiece
Step 6. Depress the inhaler to release the dose at the start of inhalation
Step 7. Maintain a slow inhalation rate until the lungs are full
Step 8. Remove the MDI from the mouth and breathe hold for 5–10 s
Step 9. If more than one dose each time wait about 30 s before the next dose
Step 10. Rinse mouth and if possible brush teeth after dosing
Step 11. Replace the cap on MDI

	Visit 1	Visit 2	Visit 3	p value
Step 1	81	81	81	NS
Step 2	44	53	69	<0.05
Step 3	16	41	47	<0.05
Step 4	15	19	21	<0.05
Step 5	81	81	81	NS
Step 6	81	81	81	NS
Step 7	15	16	26	<0.05
Step 8	25	37	63	<0.001
Step 9	34	36	61	<0.001
Step 10	49	58	75	<0.001
Step 11	81	81	81	NS
Mean (SD) number of correct steps	6.4 (1.0)	7.2 (1.1)	8.4 (1.1)	<0.001
Total number of correct steps	521	586	679	<0.05

Elgendy MO, et al. Asthmatic children and MDI verbal inhalation technique counseling. Pulm Pharmacol Ther. 2020 Apr;61:101900.

Uso de feedback

Journal of Drug Delivery Science and Technology
Volume 74, August 2022, 103539

The impact of using different add-on devices to pressurized metered-dose-inhalers containing salbutamol in healthy adult volunteers: An in-vivo study

Ahmed H.M. Sobh [a b], Hoda Rabea [b], Manal Ali Hamouda [c], Farid Shawky [d], Haitham Saeed [b], Mohamed E.A. Abdelrahim [b]

[a] Clinical Pharmacy Department, Faculty of Pharmacy, Ahram Canadian University, Giza, Egypt

Uso de feedback

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ELSEVIER

Journal of Drug Delivery Science and Technology
Volume 74, August 2022, 103539

The impact of using different add-on devices to pressurized metered-dose-inhalers containing salbutamol in healthy adult volunteers: An in-vivo study

Ahmed H.M. Sobh [a b], Hoda Rabea [b], Manal Ali Hamouda [c], Farid Shawky [d], Haitham Saeed [b], Mohamed E.A. Abdelrahim [b]

[a] Clinical Pharmacy Department, Faculty of Pharmacy, Ahram Canadian University, Giza, Egypt

Table 1. Steps of Correct pMDI Inhalation Technique.

pMDI Inhalation Technique Steps
Step 1. Remove the pMDI protective cap.
Step 2. Shake the pMDI before use.
Step 3. Exhale smoothly as far as comfortable.
Step 4. Put the mouthpiece of the pMDI between your teeth and cover it with lips.
Step 5. Ensure that your tongue does not block the pMDI mouthpiece.
Step 6. Press the inhaler at the start of inhalation to emit the dose.
Step 7. Maintain a slow inhalation rate until your lungs are filled.
Step 8. Remove the pMDI from your mouth and hold your breath for 5–10s
Step 9. Wait for 30s before taking another aerosol dose, if more than a single dose is needed.
Step 10. Rinse your mouth and brush your teeth.
Step 11. Replace the cap on the pMDI.

Uso de feedback

Journal of Drug Delivery Science and Technology
Volume 74, August 2022, 103539

The impact of using different add-on devices to pressurized metered-dose-inhalers containing salbutamol in healthy adult volunteers: An in-vivo study

Ahmed H.M. Sobh [a b], Hoda Rabea [b], Manal Ali Hamouda [c], Farid Shawky [d], Haitham Saeed [b], Mohamed E.A. Abdelrahim [b]

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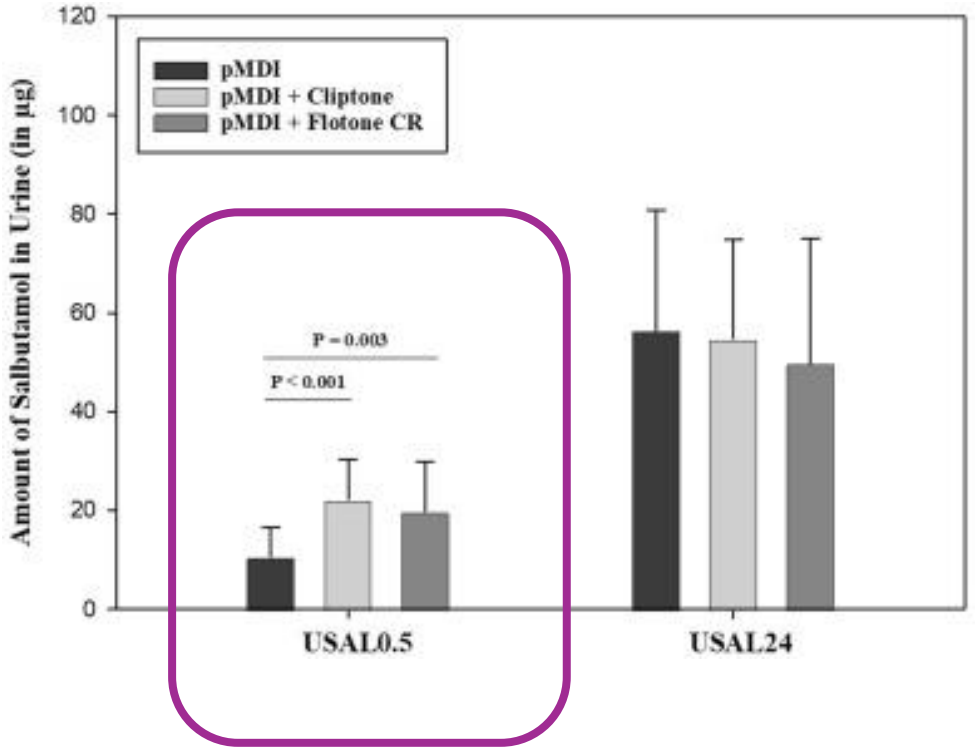

	pMDI	pMDI + Cliptone	pMDI + Flotone CR
USAL 0,5	10.68 ± 5.82	22.2 ± 8.21	19.83 ± 9.94
USAL 24	56.48 ± 24.42	54.77 ± 20.18	49.76 ± 25.30

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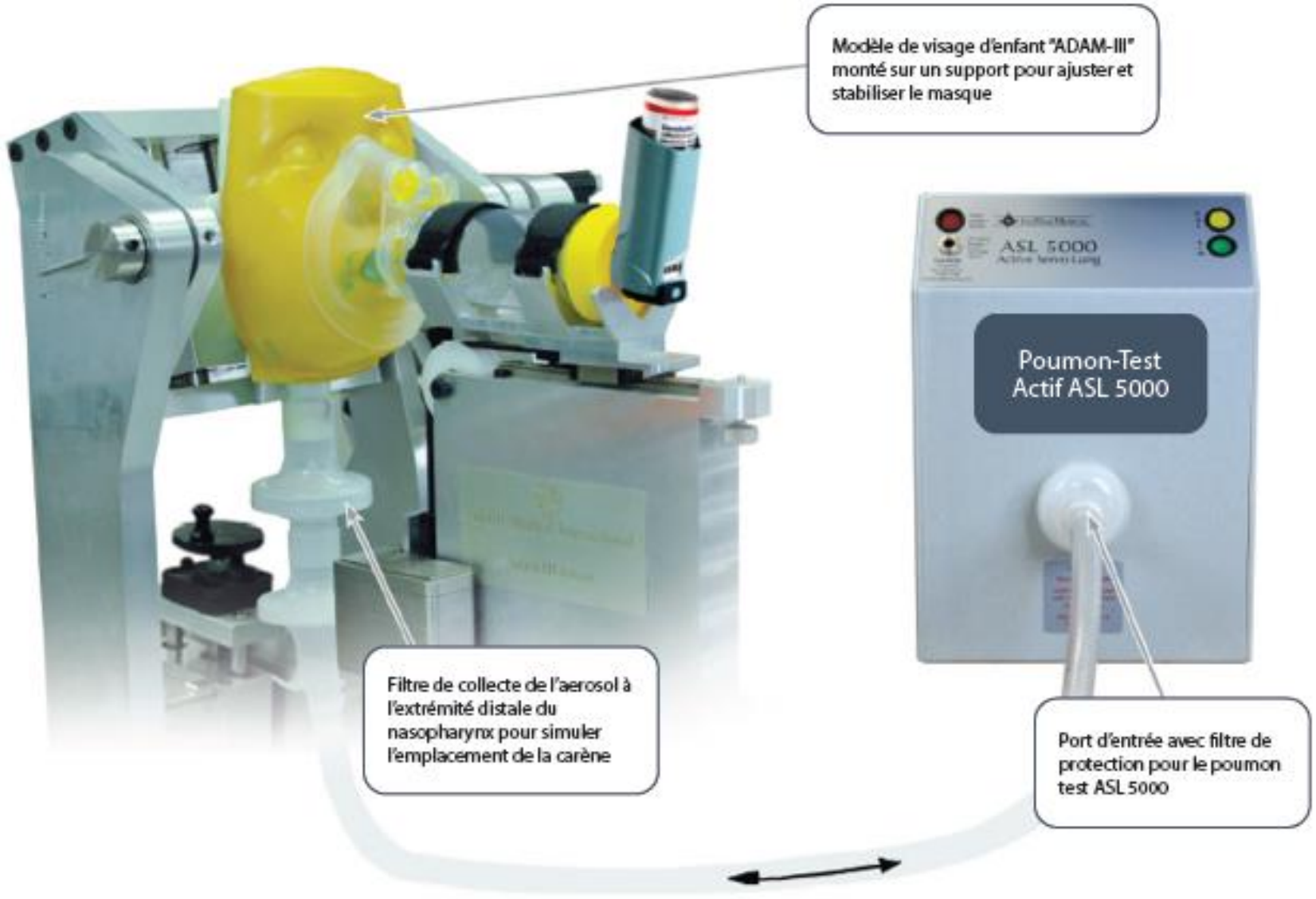
¿Y qué sucede en Chile?


Modèle de visage d'enfant "ADAM-III" monté sur un support pour ajuster et stabiliser le masque
ASL 5000
Poumon-Test Actif ASL 5000
Filtre de collecte de l'aerosol à l'extrémité distale du nasopharynx pour simuler l'emplacement de la carène
Port d'entrée avec filtre de protection pour le poumon test ASL 5000

Aerocámaras evaluadas - adultos

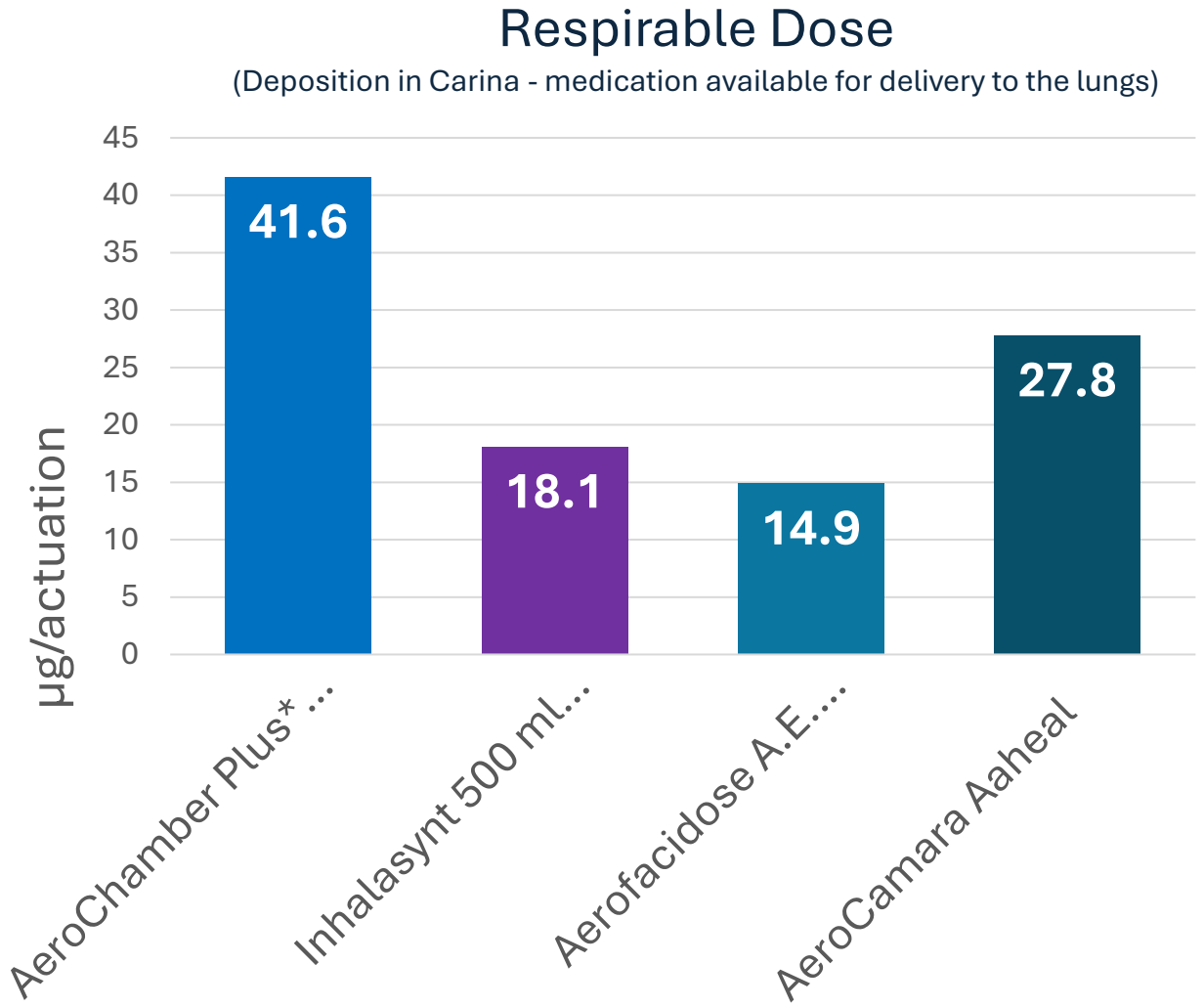
AeroChamber

Aerofacidose A.E.
Mouthpiece

Inhalasynt 500 ml
Mouthpiece

Aerocámara
Aaheal

RESULTS



Additional Puffs Needed Compared to the AeroChamber

Inhalasynt — 2.3 X

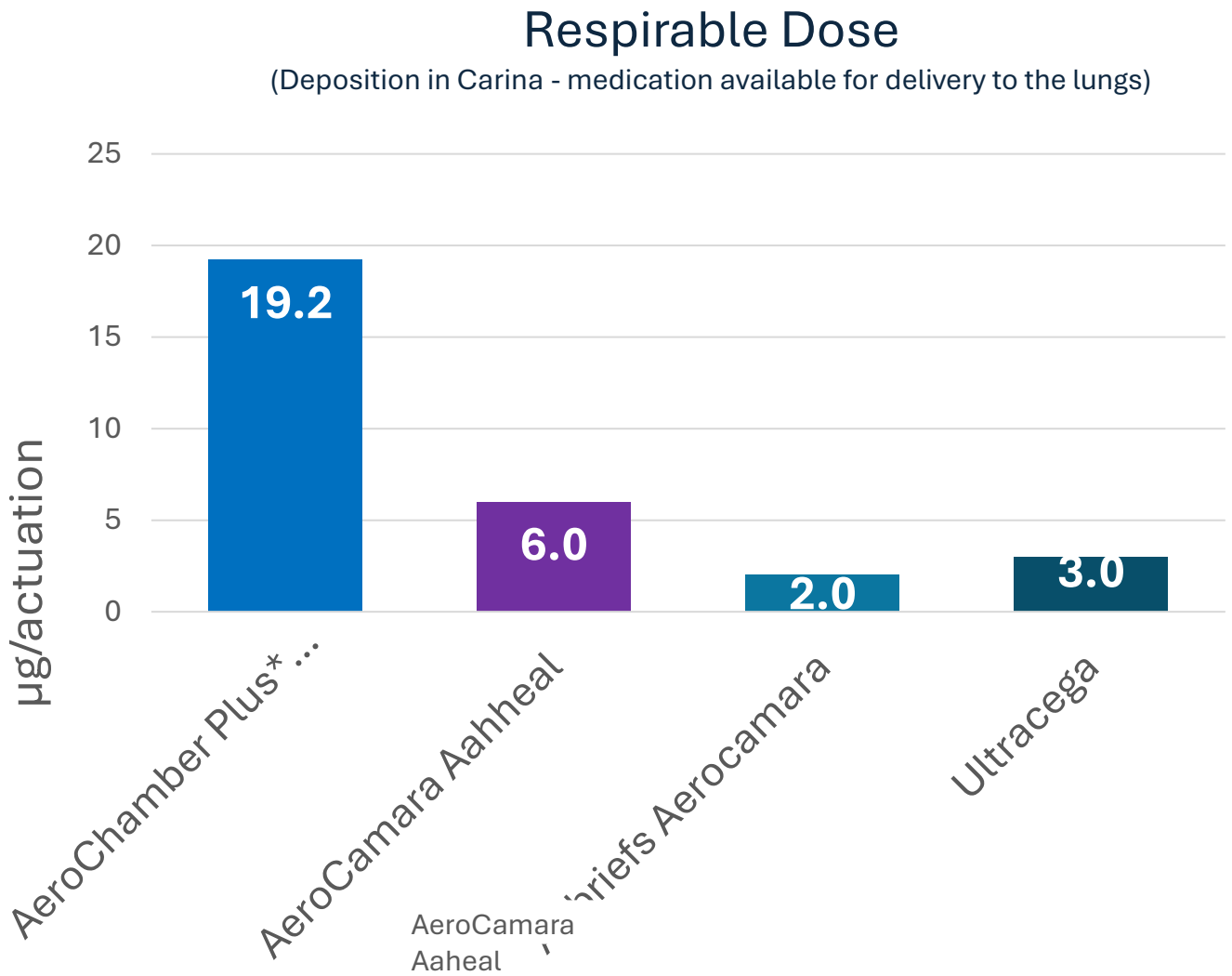
Aerofacidose A.E. — 2.8 X

AeroCamara Aaheal — 1.5 X

Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025

Rationale	Methods	Results	Conclusion

RESULTS



Additional Puffs Needed Compared to the AeroChamber* VHC

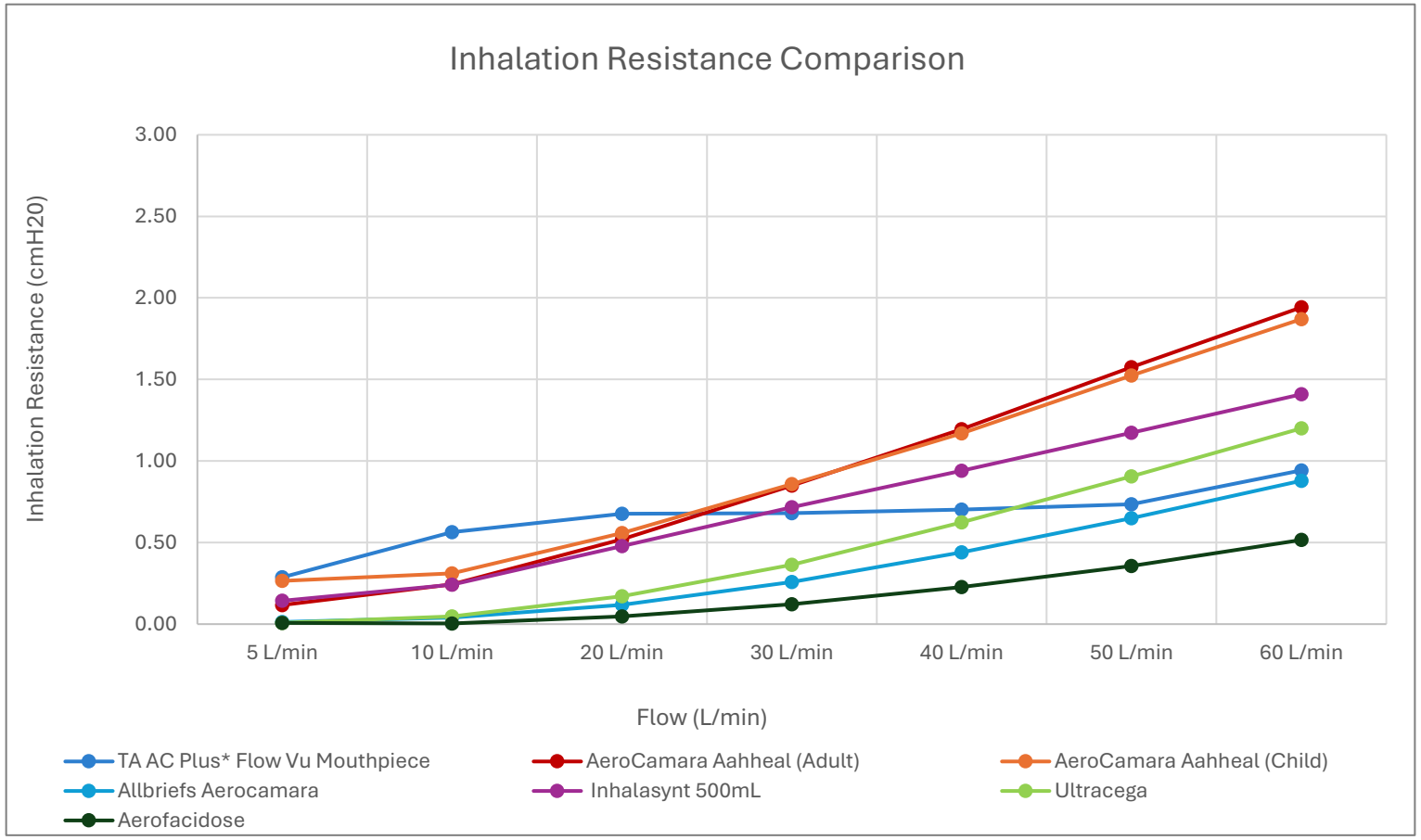
AeroCamara Aaheal — 3.2 X

Allbriefs Aerocamara — 9.6 X

Ultracega — 6.4 X

Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025

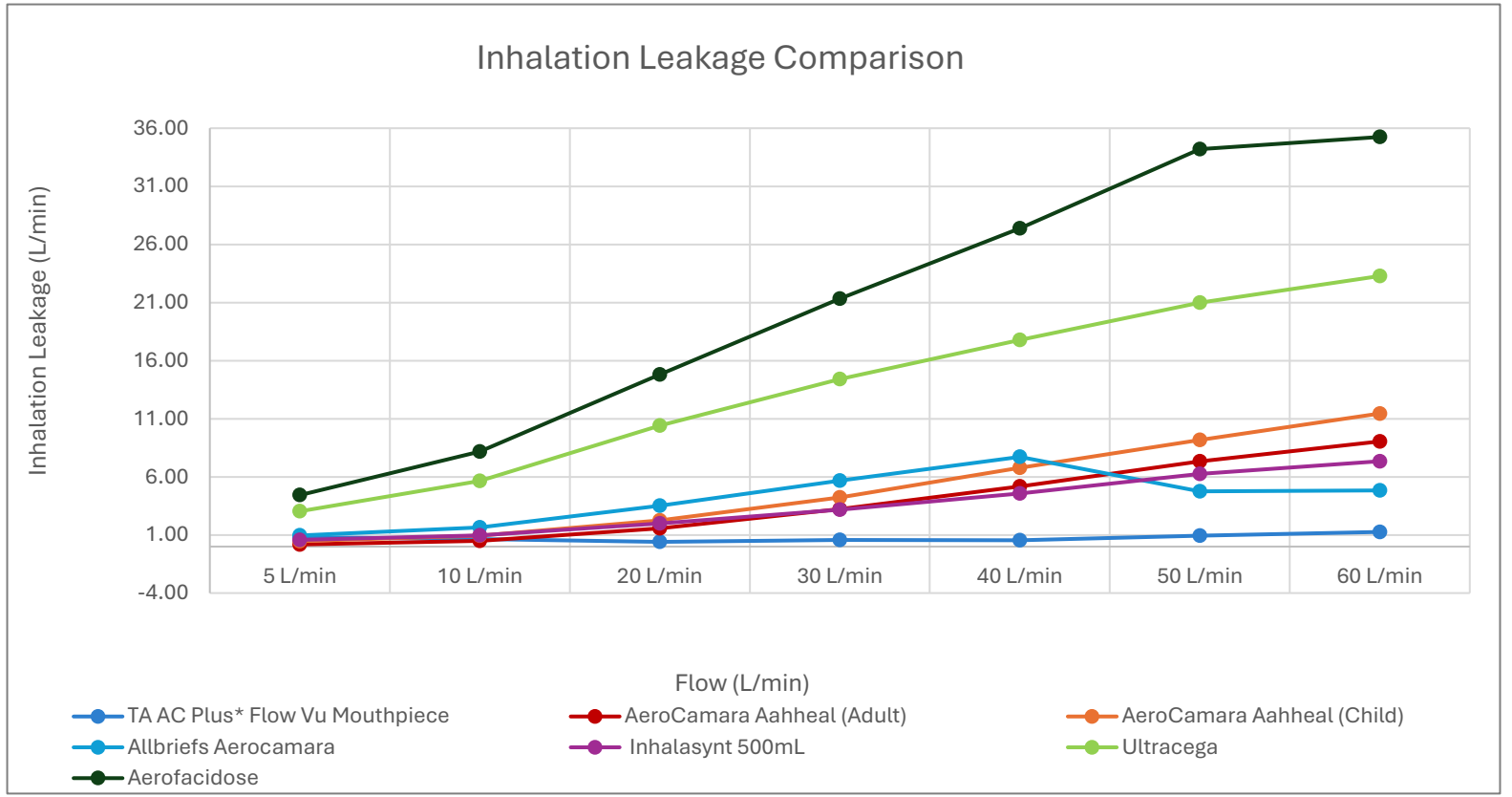
Rationale	Methods	Results	Conclusion



Inhalation Resistance (cmH_20) – The pressure drop generated across the inhalation valve during a controlled inhalation flow is recorded as a measure of the resistance to inhalation. TMI-SOP-TLP-0027

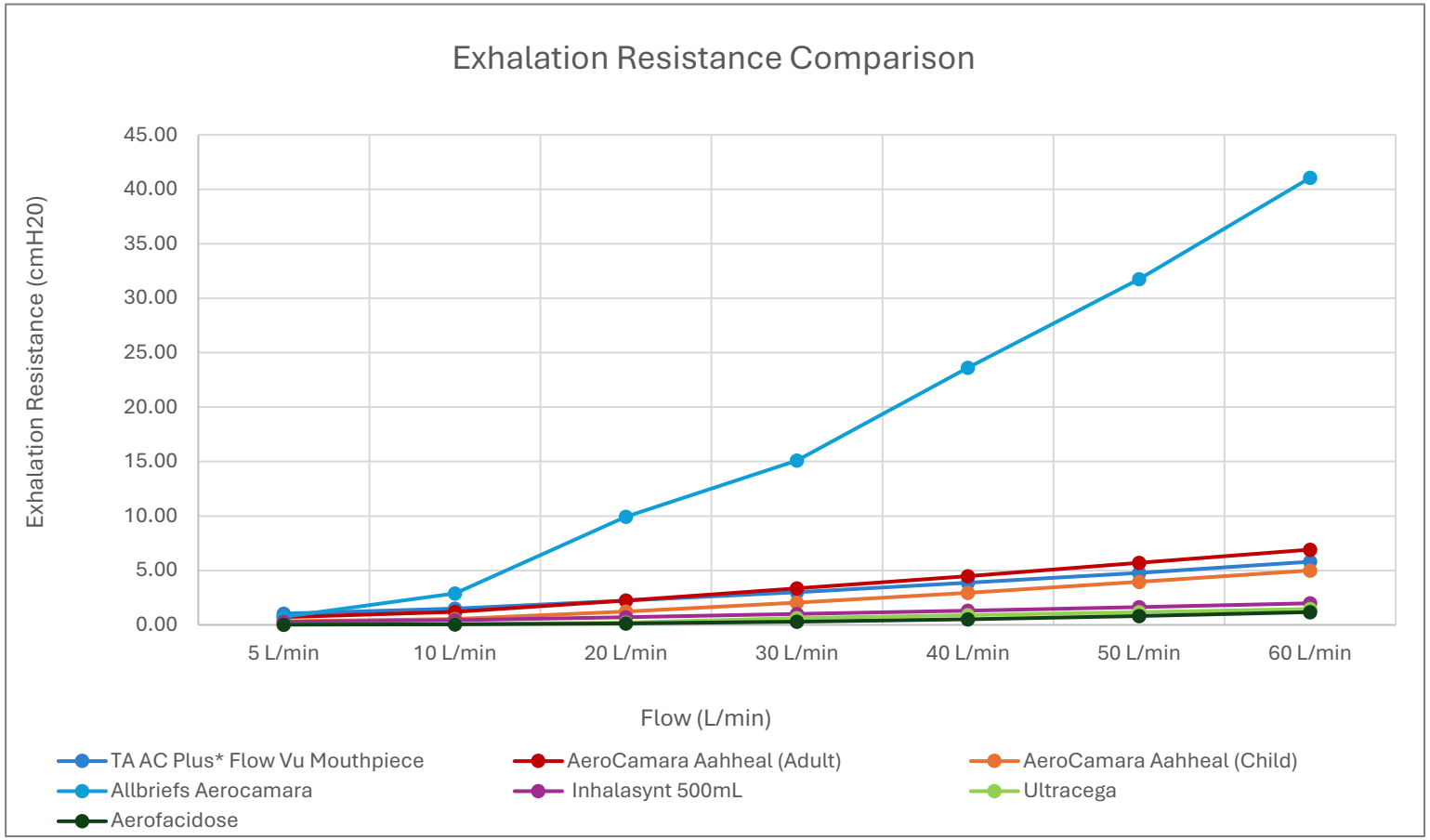
Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025

Graph can be found in the TLR2024-308 – Results Tab cells BT-CO



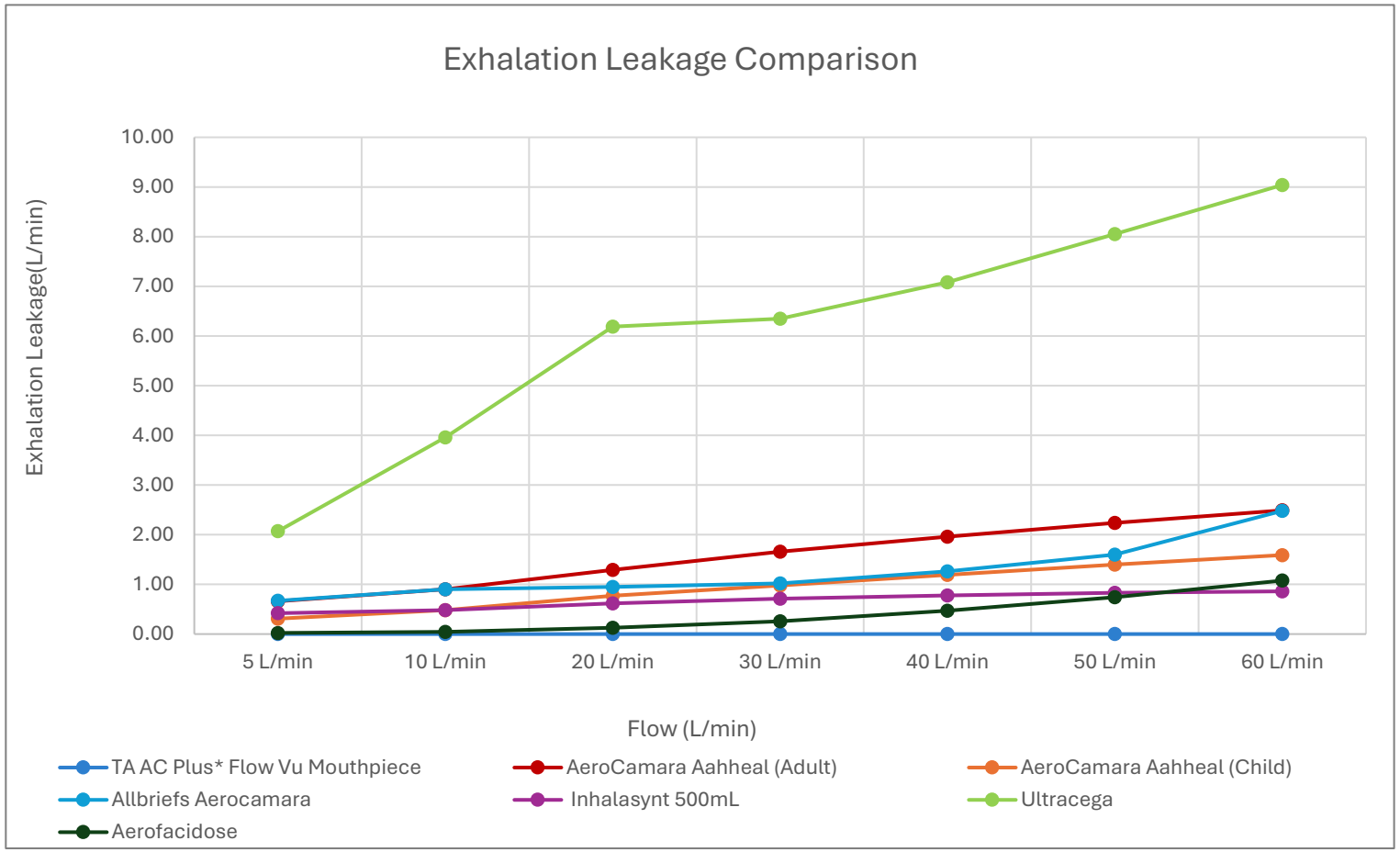
Inhalation Leakage (lpm) – The inhalation flow rate is controlled, and the chamber flow is measured at the MDI Adapter. Inhalation leakage is the difference between the controlled flow rate and the chamber flow rate.

Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025



Exhalation Resistance (cmH_20) – The back pressure generated by a controlled exhalation flow is plotted against the controlled flow rate, with the slope of the line representing the exhalation resistance.

Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025



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Exhalation Leakage (lpm) – The flow rate which passes by the valve and enters the chamber during a controlled exhalation flow is recorded as the exhalation leakage.

Puppo H, et al. Comparación de la Eficiencia de la Administración de Salbutamol en Aerocámaras pediátricas y de Adultos disponibles en Chile. Revista Kinesiología, 2025

Conclusiones

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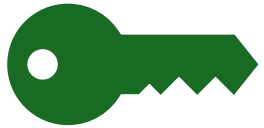

La clave no sólo es el fármaco, sino que también la técnica

Educación como eje central para mejorar el tratamiento

Importante conocer características de los dispositivos → exíjalas al vendedor

¡Gracias!

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Las claves para mejorar la técnica inhalatoria

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