

Endose

Medication Dosing

Course: DSGN 384: Interdisciplinary Product Design

Client: Lurie Children's Hospital

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Working with Lurie Children's Hospital to ease the transition to at-home medication management



[1]



[2]

At-home medication management is a complex problem



The Mission: Design a medication dosing solution that empowers parent-caregivers to administer **liquid medications** with **confidence** and **precision**, decreasing the frequency of misadministration events

The ENdose helps caregivers measure the correct dose every time



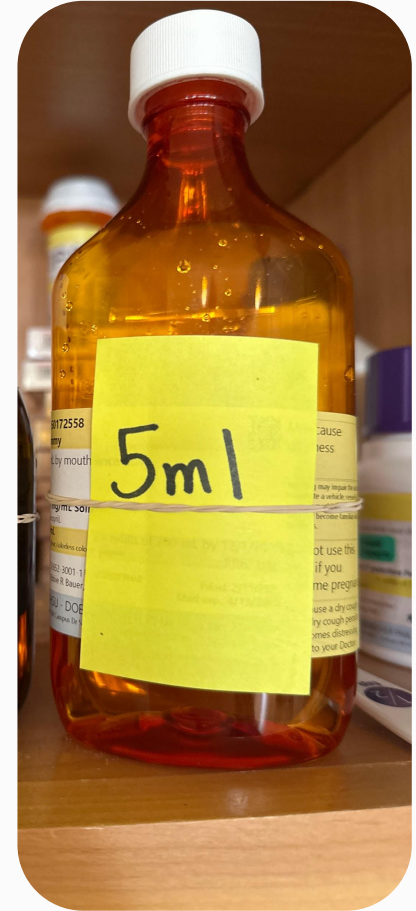
Newer caregivers feel overwhelmed by complex, changing medication schedules

“For parents it can be overwhelming: medications constantly, specific times, dose-dependent side effects. There’s a learning curve.”

- Reem (Pharmacist and Caregiver)



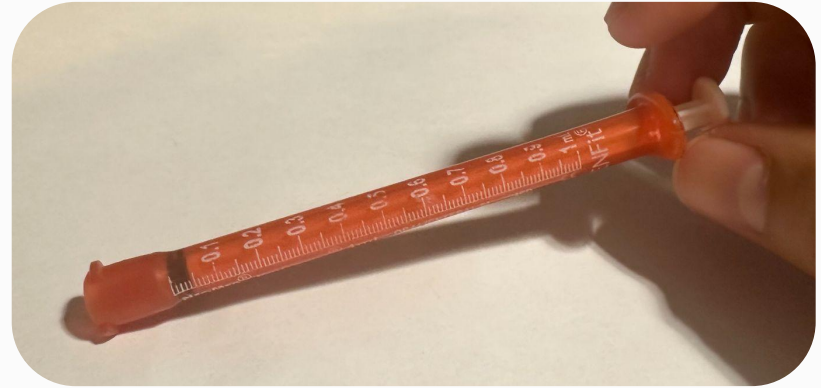
Syringe markings are difficult to read, especially for decimal doses



Syringe markings fade after < 10 washes, harming precision

“It used to have numbers back here,
but they've all washed off, wow. So we
put medicine tape over it to try to
make it live longer.”

– Jess (Caregiver)

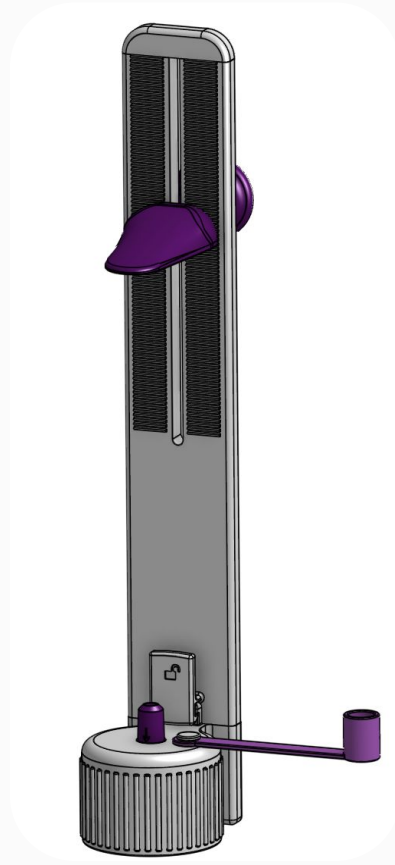


Caregivers have zero room for medication loss



Interviewing caregivers and experts allowed us to prioritize design requirements:

- 1) Precision of down to 0.05 mL
- 2) Safe and secure in the presence of young children
- 3) Compatibility with existing medication bottles and syringes
- 4) Under 5 minutes to learn
- 5) Easily adjustable in under 5 seconds



The ENdose lets caregivers continue using hospital-provided syringes, even after markings fade



Using the ENdose: Setup



Using the ENdose: Usage



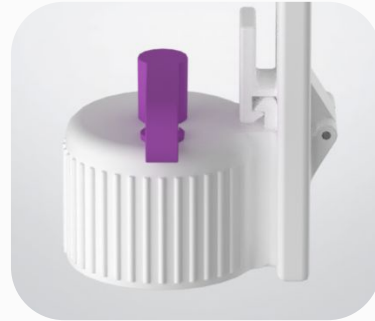
The ENdose is composed of several subsystems



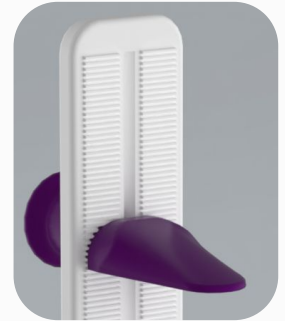
Child Safety



Leak Protection

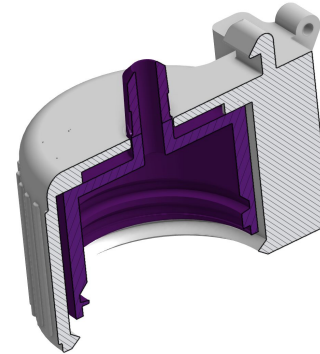
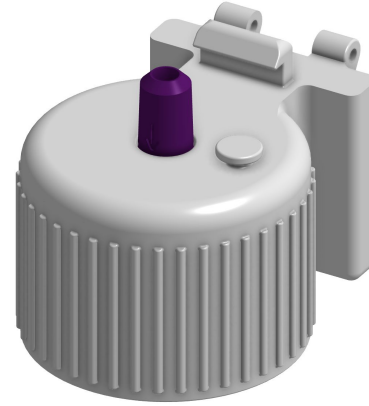


Storage

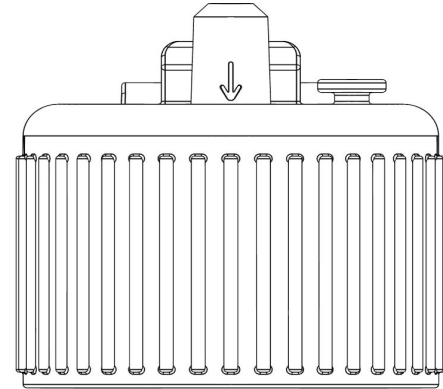
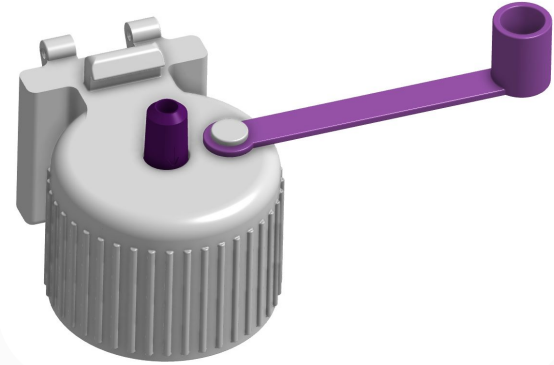


Adjustability

The push and turn
cap aims to keep
both children and
medicine safe

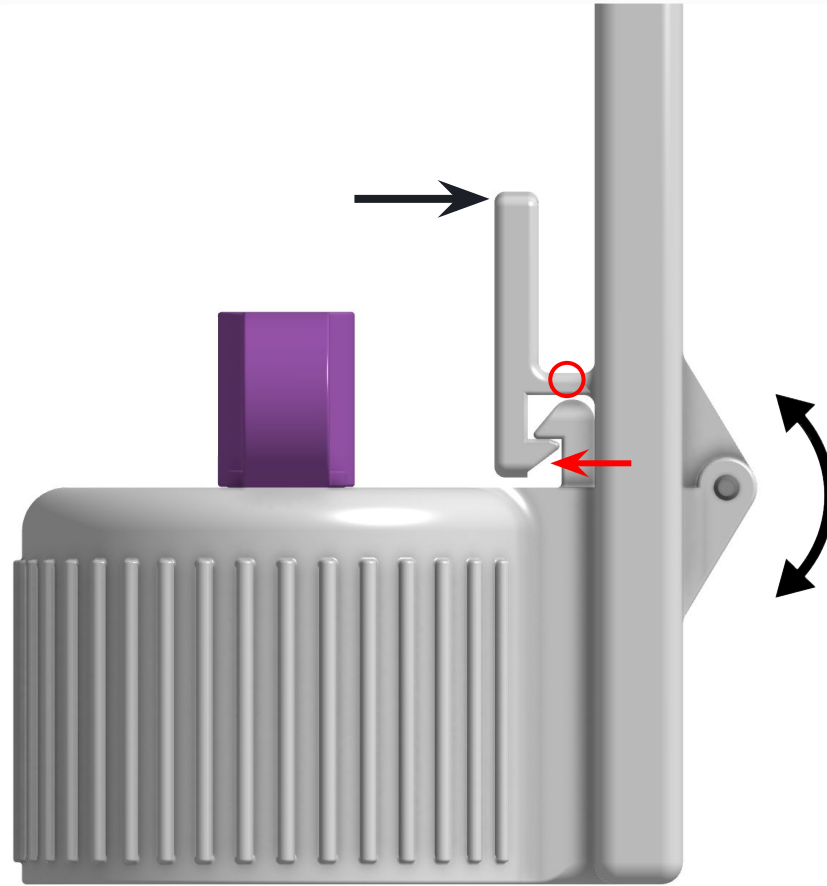


ENFit port enables
medication transfer by
direct syringe
attachment



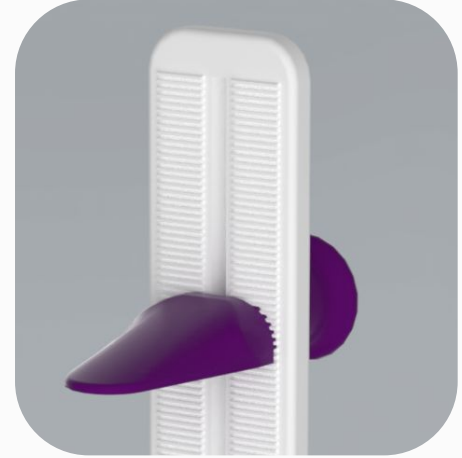
The neck locks in place for use, but folds down for storage

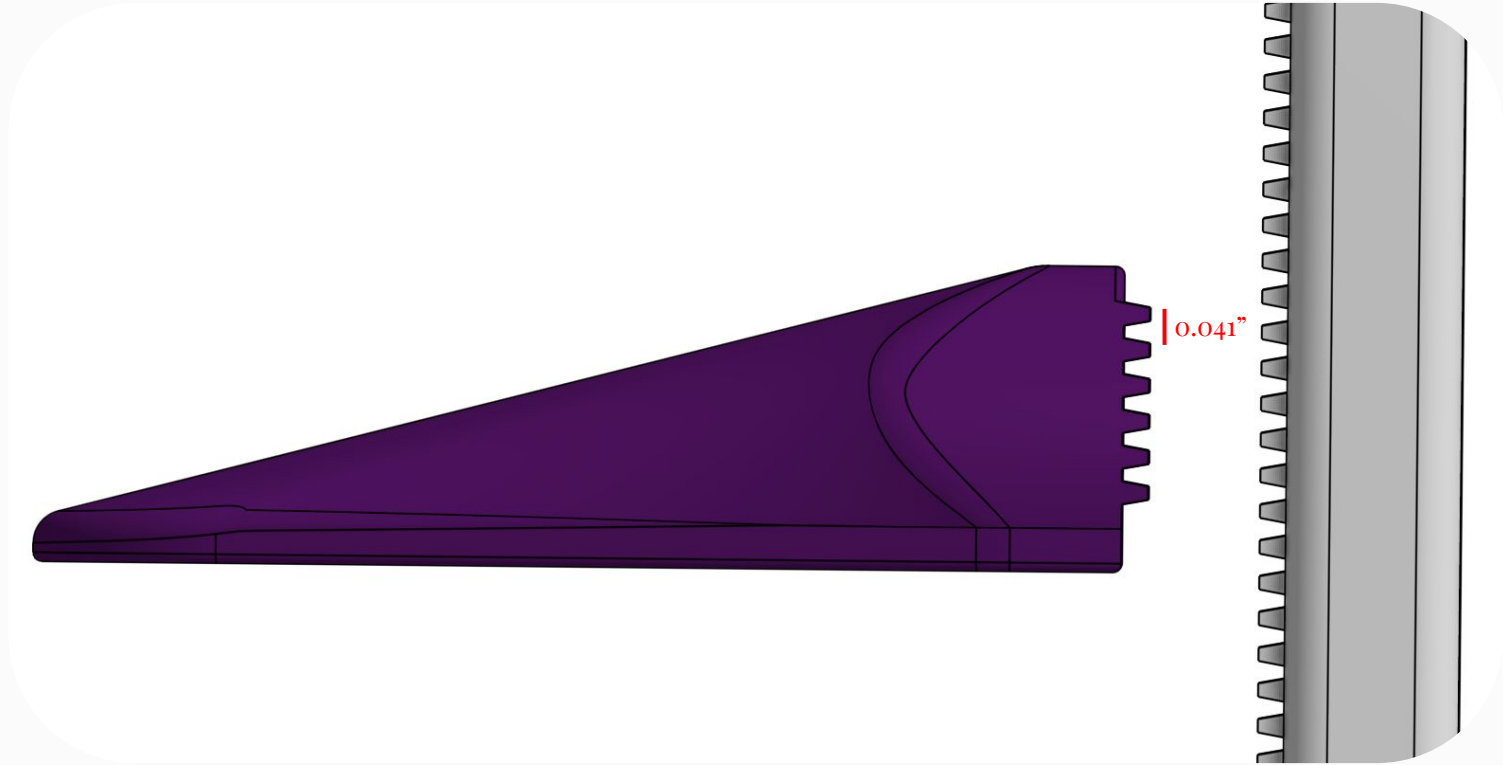






To keep dosing
precise, the
ENdose uses teeth
on both the neck
and the limiter





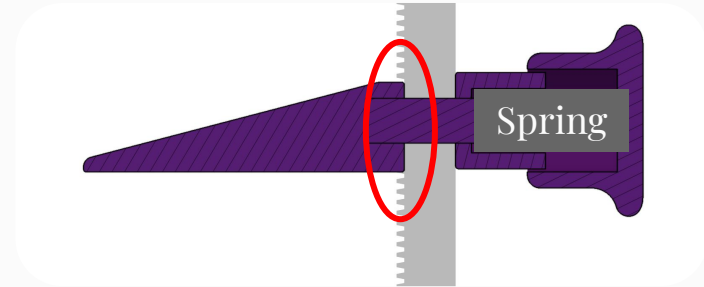
0.041"



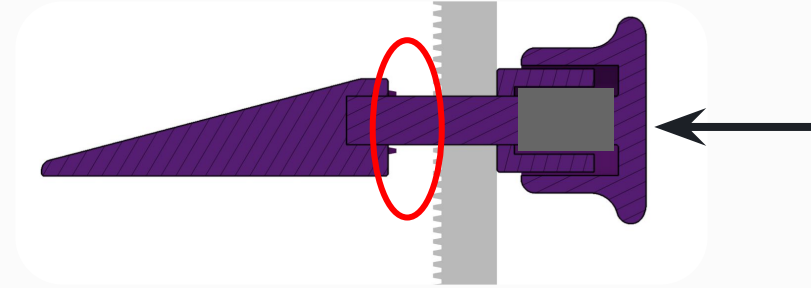
[3]

The enclosed spring keeps the ENdose tightly calibrated when not in use

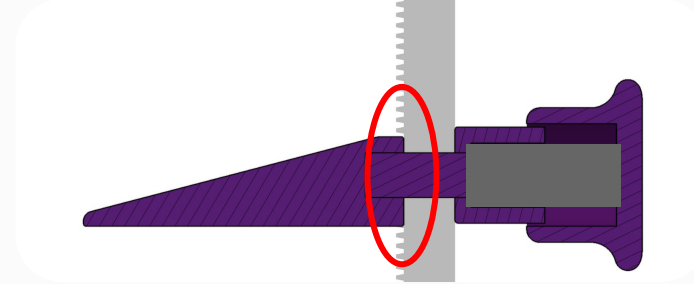
1)

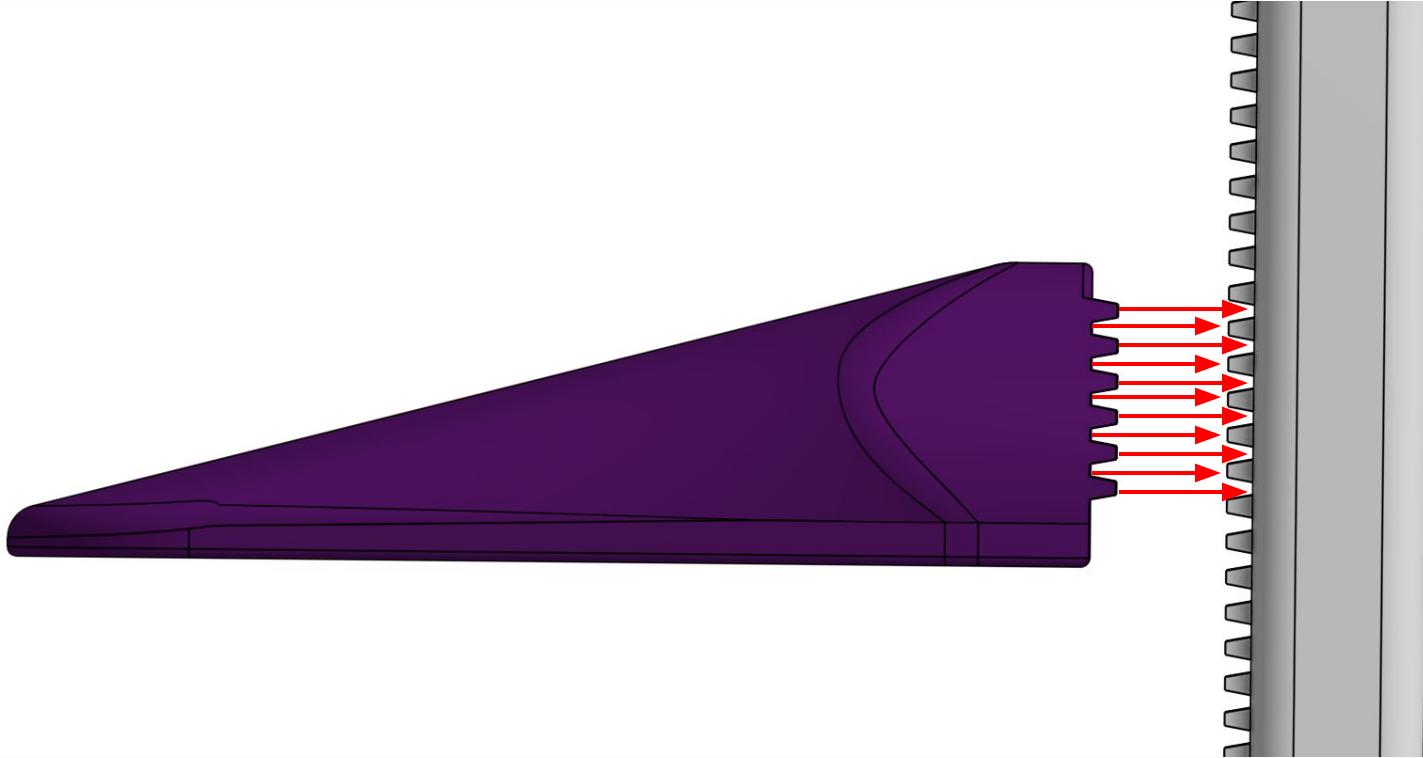


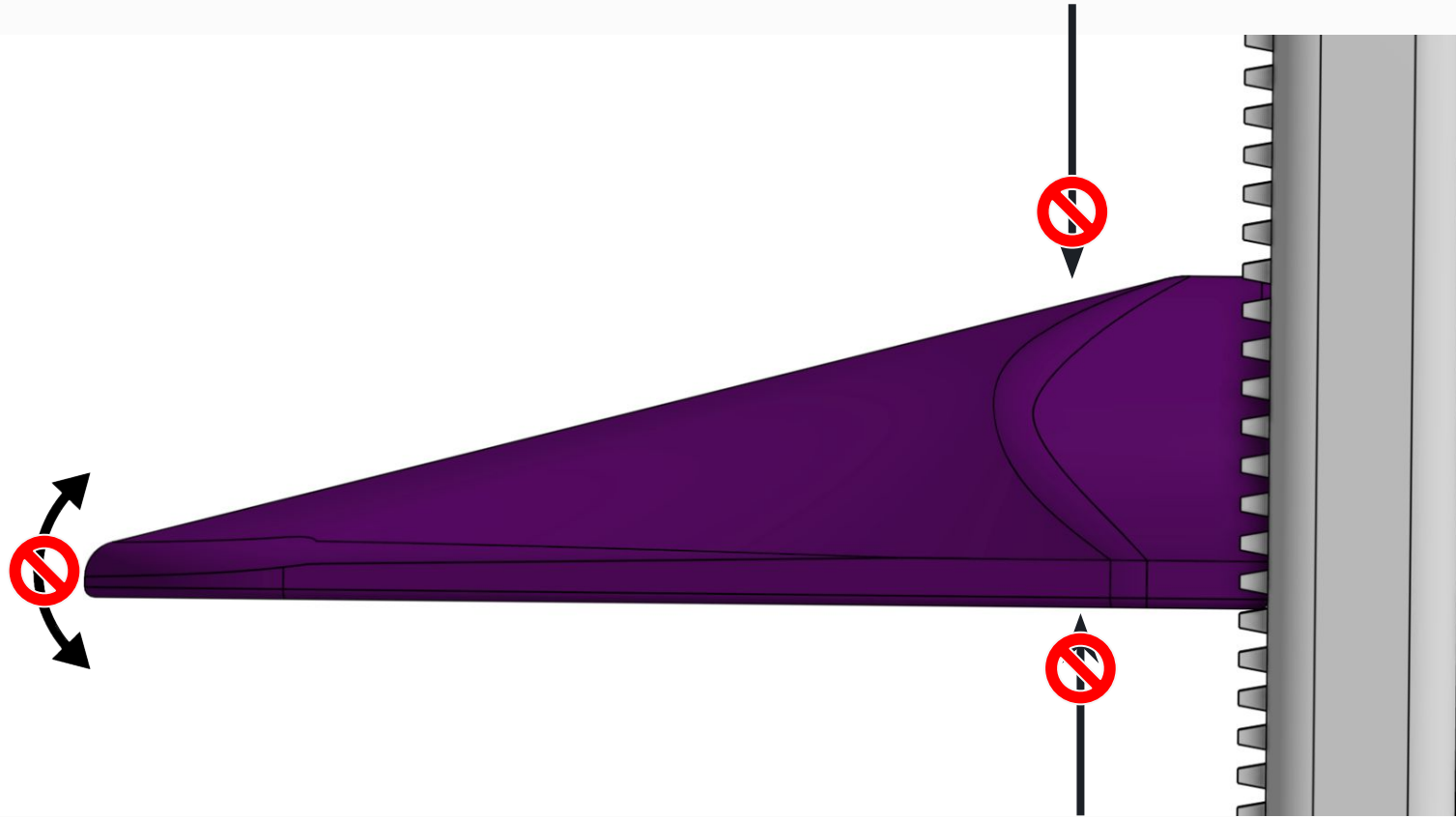
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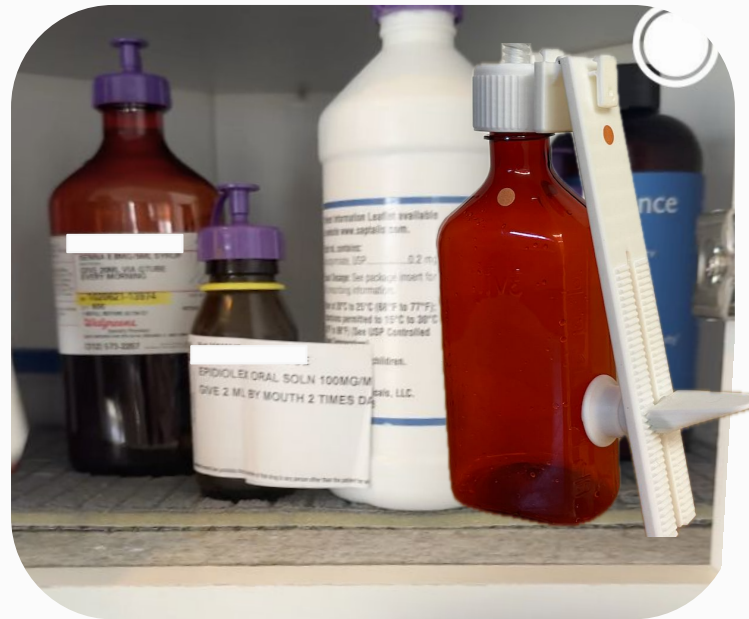
3)



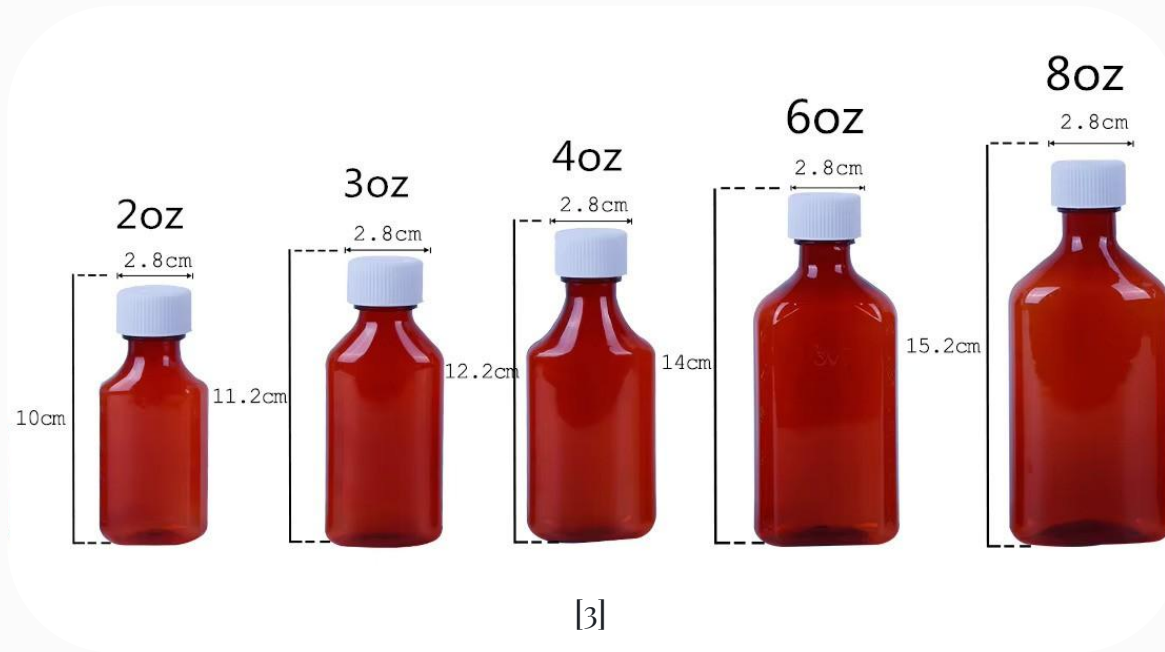




The device fits into caregivers' existing at-home workflows



The BMSS can be made in different sizes for various medication bottles



Testing shows the
ENdose is precise and
leak-proof

$0.05 \pm 0.058 \text{ mL}$

Dosing Error (Mean $\pm$ Standard Deviation)

ENdose has
minimal leakage

Next steps: Bringing the ENdose to more caregivers

- 1) Print 20–30 ENdose prototypes
- 2) Gather user feedback
 - a) Precision test with more caregivers, including low-HCL caregivers
 - b) Improve workflow integration
 - c) Confirm child tamper resistance
- 3) Optimize design for injection molding

Thank you to everyone who helped us throughout this project

Northwestern Faculty

- Stacy Benjamin
- John Anderson
- Dan Brown

Lurie Children's Hospital Staff

- Leah West
- Kimberly Tyk

Caregivers

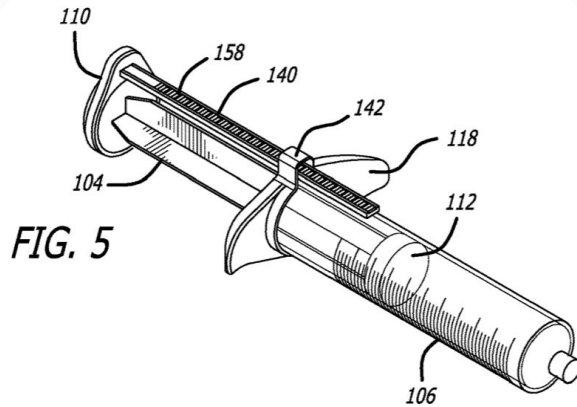
- Tyler Robinson
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- Jess Etheridge
- Brianna Dascher

Experts

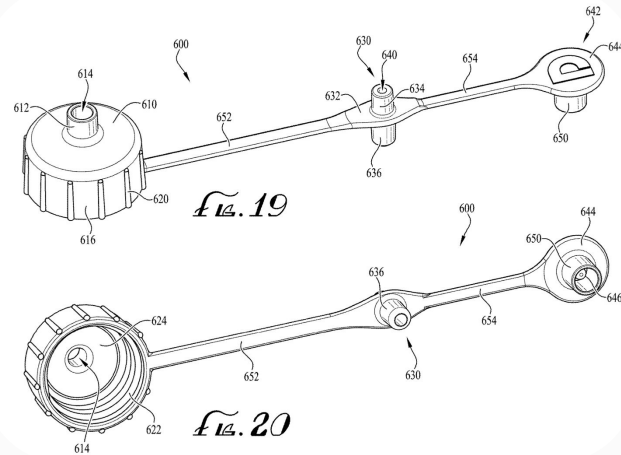
- Emma Kowiak
- Lin Sanders
- Dr. Joe Avni-Singer

Endose

Existing U.S. patents suggest the ENdose intellectual property (IP) could be patented and commercialized



[4]

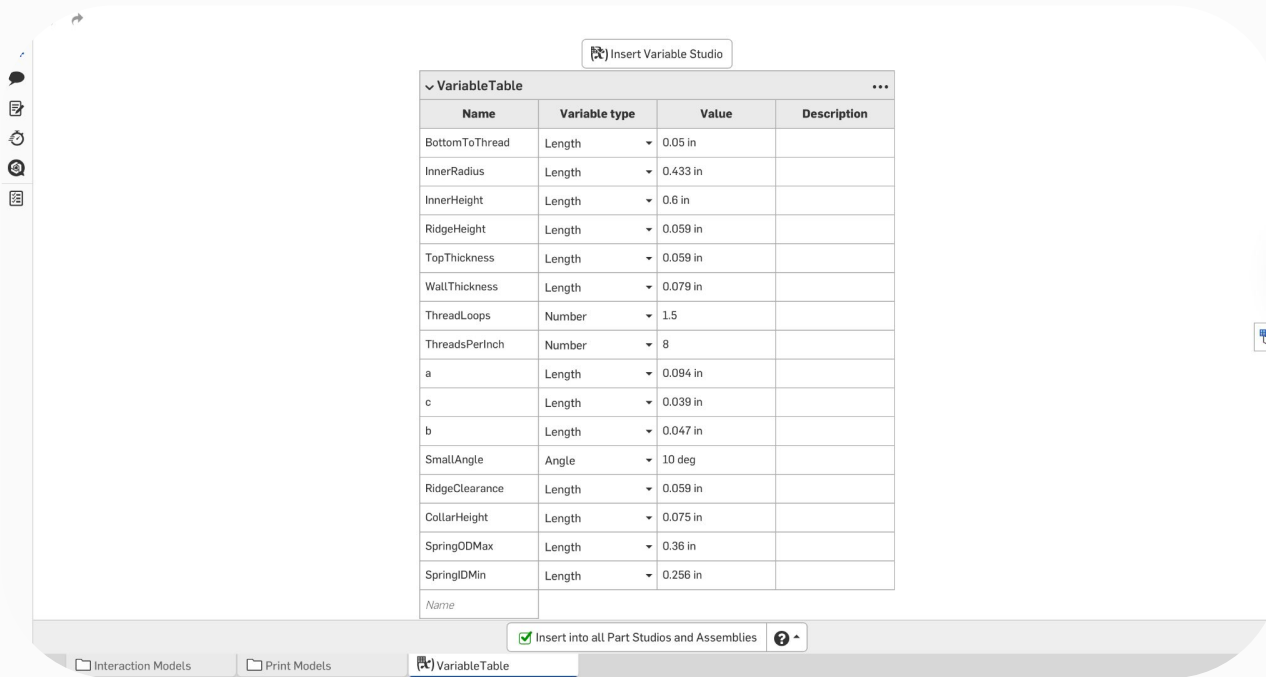


[5]

The ENdose can be injection molded without losing precision

Feature	Figure	Tolerance Component	Material	SPI Geometry (A-H) [1]	Tolerance Value (in)	
Hinge (Cap to Pin)	1	Cap Hole	HDPE	F	0.003	
		Pin Diameter	Stainless Steel		0.0003	
		NC			0.006	
Hinge (Pin to Neck)	2	Neck Hole	HDPE	F	0.003	
		Pin Diameter	Stainless Steel		0.0003	
		NC			0.006	
Teeth (Stopper to Neck)	3	Neck Teeth	HDPE	E	0.006	
		Stopper Teeth	HDPE	E	0.006	
		NC			0	
<i>*Expected maximum space between the tip of the syringe and the top surface of the cap that a user could leave upon inserting a syringe without noticing misuse'.</i>				Subtotal (Molded Components)		0.0126
				User Error Tolerance*		0.025
				Total		0.0376

Parametric CAD modeling allows the cap to be adjusted to different bottle finishes in seconds



References

- [1] Please Save Damian, “How to change a G-Tube Button  Feeding Tube Life,” YouTube, May 08, 2024.
<https://www.youtube.com/watch?v=r8VvS2hAVbg> (accessed Mar. 16, 2026).
- [2] Lurie Children’s Single Ventricle Center of Excellence, “Patient Spotlight (Fun Friday Flip the Script) – Featuring Marshall,” Facebook.com, Feb. 27, 2026. [https://www.facebook.com/photo.php?fbid=1491087889689053&set= pb.100063635675503.-2207520000&type=3](https://www.facebook.com/photo.php?fbid=1491087889689053&set=pb.100063635675503.-2207520000&type=3) (accessed Mar. 16, 2026).
- [3] “Amazon.com.” Accessed: Mar. 11, 2026. [Online]. Available:
<https://www.amazon.com/Vesco-Medical-ENFit%C2%AE-Syringe-10ml/dp/BoDL4ZM2DL>
- [3] “Wholesale 8oz 16oz Oral Liquid Bottle PET Wockhardt Bottle Cough Syrup Bottle 250ml,” www.alibaba.com, 2021.
https://www.alibaba.com/product-detail/Wholesale-8oz-16oz-Oral-Liquid-Bottle_1600288430444.html (accessed Mar. 16, 2026).
- [4] J. J. Schwab, E. J. Kayda, Z. Dominguez, and C. Mudd, “Mechanical syringe accessory,” US10265477B2, Apr. 23, 2019 Accessed: Mar. 13, 2026. [Online]. Available: [https://patents.google.com/patent/US10265477B2/en?q=\(enfit+syringe +accessory \)&oq=enfit+syringe+accessory](https://patents.google.com/patent/US10265477B2/en?q=(enfit+syringe+accessory)&oq=enfit+syringe+accessory)
- [5] B. M. Davis, M. M. COSTELLO, and B. Ledwith, “Fluid transfer connector,” US12036183B2, Jul. 16, 2024 Accessed: Mar. 13, 2026. [Online]. Available: [https://patents.google.com/patent/US12036183B2/en?q=\(enfit+syringe\)&scholar&oq= enfit+syringe&page=4](https://patents.google.com/patent/US12036183B2/en?q=(enfit+syringe)&scholar&oq=enfit+syringe&page=4)