A More Effective Limb Splint

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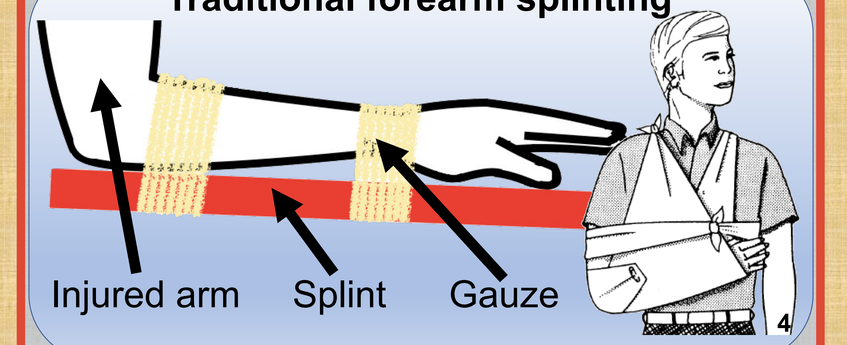
Abstract

The traditional limb splinting is ineffective, as it requires significant manipulation of the affected limb during application. Excessive manipulation of potentially fractured limbs can lead to avoidable pain and injury.

Our 3D-printed, adjustable, and circumferential splint minimizes the time and movement necessary when applying a splint. It incorporates an inflation padding system to optimally conform to the limb and adjust the pressure, further minimizing movement and thus further pain and injury.

Traditional forearm splinting



Facts:

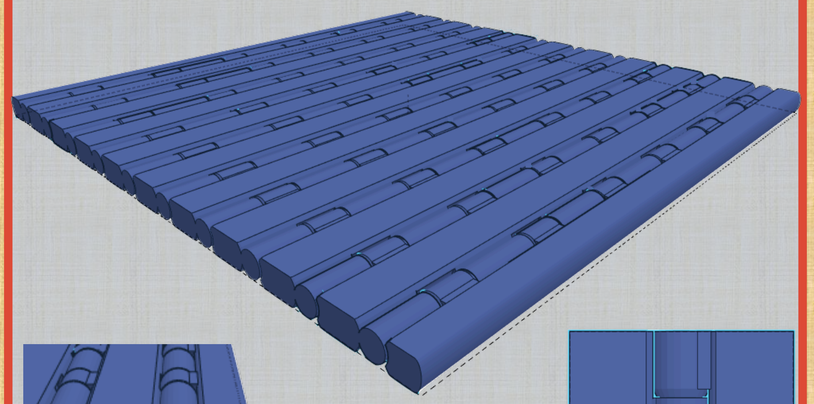
- 90% of the fractures weren't splinted properly, according to a study by the pediatric bone specialists at the University of Maryland.[1]
- The incidence rate for all limb fractures is 1,596 cases per 100,000 person-years.[2]

Issues to Address

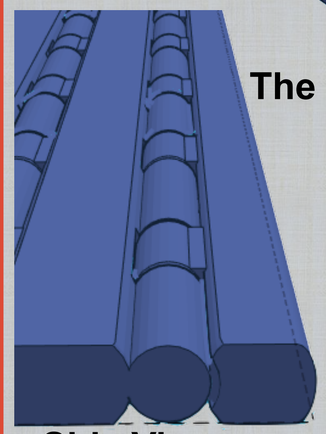
Application issues of traditional splinting:

Time **Movement** **Confusion**

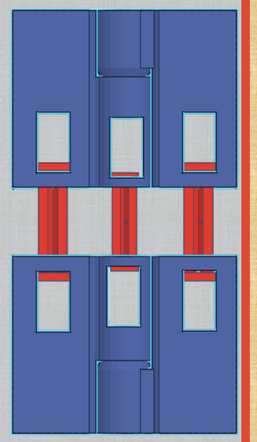
3D Printed Design



The Outer Frame



Side View: Hinge System

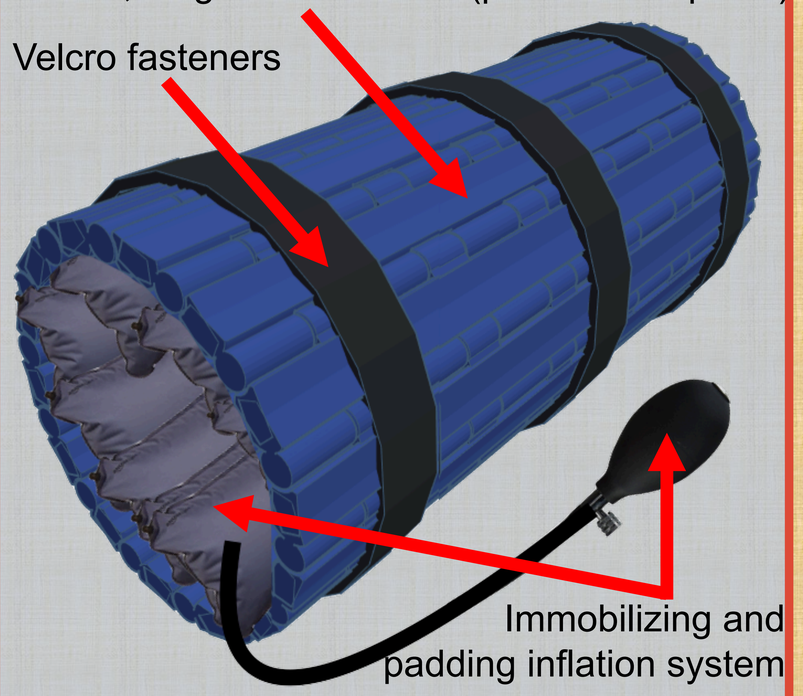


Top View: Extender

Final Product

Plastic, hinged outer frame (printed as 1 piece)

Velcro fasteners



Includes incorporated extenders (not shown)

Discussion

Application
- Easy on/Easy off - “wrap, latch, and pump”
- Facilitates proper, beneficial splinting

Sizing
- Available in various sizes to fit all limbs

Material options
- ABS plastic – non-toxic, non-allergenic, cheap, easily cleaned, recyclable & sturdy.
- Aluminum – light, easily cleaned, precedent in medicine. Sturdier but also costlier.

Swelling
- Inflation system enables natural swelling & prevents “pressure-related complications”[3]

Limitations
- Not intended for femur and compound fractures

Conclusion

This innovative, temporary limb splint will help patients and healthcare professionals, as it minimizes the time and injury associated with splint application.
That being said, testing will be necessary for further improvement of the final product.

Acknowledgements

Professor: Dr. Edyta Greer
ITF: Dr. Jake Cohen
The Maker Hub Team

TINKERCAD

References

1) Franklin, Deborah. "Sloppy Splinting Can Make A Child's Broken Arm Much Worse." NPR. October 10, 2014. Accessed November 10, 2017. https://www.npr.org/sections/health-shots/2014/10/10/354990873/sloppy-splinting-can-make-a-childs-broken-arm-much-worse.
2) W. M. Garraway, R. N. Stauffer, L. T. Kurland, and W. M. O'Fallon. "Limb fractures in a defined population. I. Frequency and distribution." *Mayo Clinic Proceedings*54, no. 11 (1979): 701-07. Accessed November 10, 2017. https://www.ncbi.nlm.nih.gov/pubmed/?term=Limb fractures in a defined population. I. Frequency and distribution.
3) BOYD, ANNE S., HOLLY J. BENJAMIN, and CHAD ASPLUND. "Principles of Casting and Splinting." *American Family Physican*79, no. 1 (January 1, 2009): 16-22. Accessed November 10, 2017. http://www.aafp.org/afp/2009/0101/p16.html.
4) https///en.wikibooks.org/wiki/Adventist_Youth_Honors_Answer_Book/Health_and_Science/First_Aid%2C_Standard