EXECUTIVE SUMMARY

Problem
Hip dysplasia in young children is often treated using hip spica casts, which immobilize the hips and legs for proper healing. For young children ages 0-5, these casts often prevent them from fitting safely inside standard car seats. As our project partner, Dr. Michelle Macy, highlighted, this misalignment forces parents to face a choice between their own improvisations, which are often unapproved and unsafe, or costly post-operative solutions.

Our solution—SPICALIGN—addresses this gap; it is an intraoperative guide that assists medical personnel in adjusting hip spica casts so that they fit in standard car seats, reducing safety risks and financial burden.

Methodology
To develop our solution, our team conducted several interviews with experts such as car seat technicians, pediatric nurses, orthopaedic surgeons, and a Ford Design Center workshop specialist. Their insights shaped our understanding of operating room (OR) workflow constraints, car seat geometry, and our project scope. We considered a variety of mechanical and electrical component options before deciding on and building our final prototype.

Our Design
SPICALIGN is an intraoperative cast-positioning guide that helps surgeons position children's hip spica casts to fit safely into standard car seats. The device attaches to the pole of the spica cast table underneath the patient to stay out of the operating area. While the cast is drying, medical personnel will activate the machine through foot pedal commands, raising the device with a linear actuator and moving servo-controlled arms from storage (arms underneath the table) to an in-use position (arms extended above the table). The telescoping arms are manually extended and display the maximum hip width for a standard car seat, which the medical personnel will position in reference to.

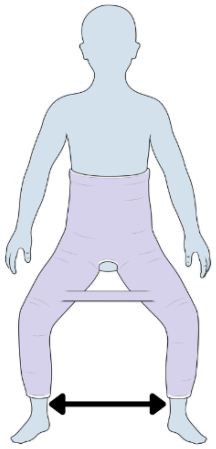
Combined, these features show a reference for cast placement while smoothly integrating into OR workflow and limitations. The compactable design, automated vertical and rotation motion, and foot pedal commands ensure that the machine minimizes disruption and accurately aids the medical personnel in adjusting cast placement.

Future Recommendations
Our plans for future development include testing in a real surgical setting, automating the telescoping functionality of the arms, combining the automated components into a singular foot pedal to improve efficiency, and compacting the device further.

SPICALIGN

Too Narrow

Problem: Children in spica casts cannot fit in standard car seats due to their casts being set too wide.



Too Wide

Solution: A workflow-integrated, intraoperative guide that shows car seat width parameters, enabling surgeons to adjust spica cast widths.

Servos	1
Telescoping Arms	2
Linear Actuator	3
Foot pedals	4

Benefits

Storable - Fits underneath the operating table

Programmable - Width between arms can be set

Integrated - 15 seconds to go from compacted to in-use. Hands-free operation

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