Department of MECHANICAL ENGINEERING
THE UNIVERSITY OF UTAH

HALO: Portable Head & Chin Rest For Ophthalmology Exams in Rural Areas

Thania Arellano, Austin Davis, Collin Grant,
Calvin Ho, Jared Solosko
Advisor: Dr. Kenneth d'Entremont

MORAN EYE CENTER
HEALTH UNIVERSITY OF UTAH

ABSTRACT

According to the World Health Organization, there are 39 million blind individuals worldwide. Ninety percent of them live in poverty in the developing world and four out of every five blind people could be cured at any modern eye clinic, but those in developing nations lack access to modern eye care. Due to this need of modern eye care in impoverished nations, the Moran Eye Center has made it a mission of theirs to visit and assist those in these nations.

While working in these rural areas, ophthalmologists currently have to rely on a steady hand and a still patient when performing common eye exams and other basic procedures due to travel constraints. This causes the quality of the exams to suffer over time, as the ophthalmologist gradually fatigues.

WHAT DO OPHTHALMOLOGISTS NEED IN RURAL AREAS?

A head/chinrest that ophthalmologists can utilize to increase the quality of eye exams performed under non-ideal conditions experienced on outreach ventures. This device must:

- Hold the patient's head steady while receiving an eye examination
- Include an attachment that will hold the handheld slit-lamp steady while being used by the doctor performing the eye examination
- Have a simple, rigid, durable, light, and portable design that minimizes set-up/disassembly time
- Be easily collapsible to facilitate ease of travel

REQUESTED HALO DEVICE SPECIFICATIONS

Design Specification	Metric	Description
Max Collapsed Dimensions	26" x 18" x 11.5"	Fit in a standard carry on suitcase
Total Weight	< 10 lbs	Low weight for easy transportation
Slit Lamp Adjustment	8" Vertical 5" Horizontal 1.5" Forward/Back	Necessary movement for eye examinations

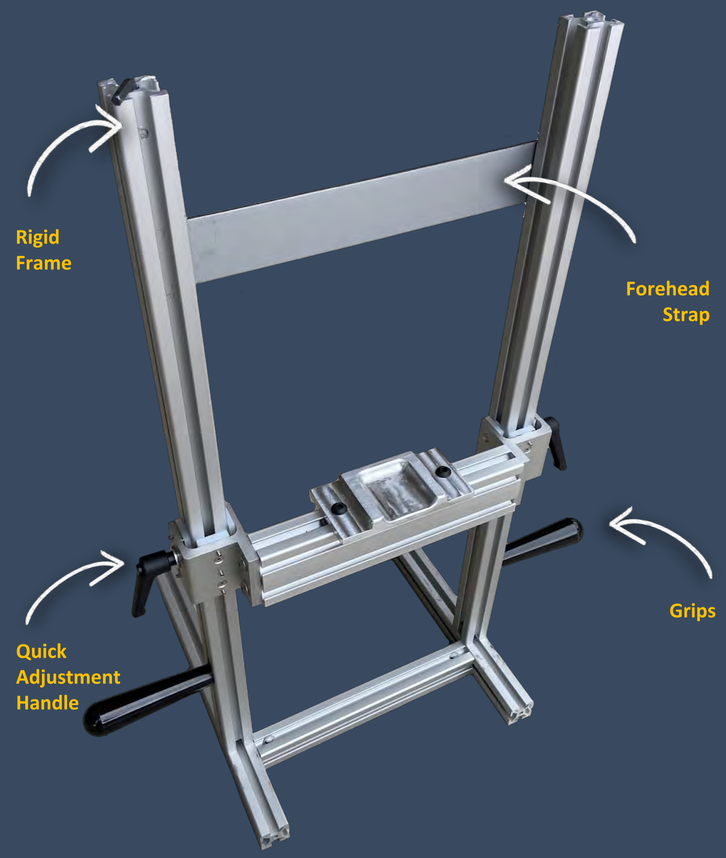
COST COMPARISON

$1000-$3000

Comparable device on the market

$400

HALO: Portable Head & Chin Rest

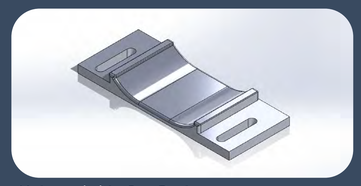


THE NAVAJO NATION OUTREACH

A MODULAR APPROACH

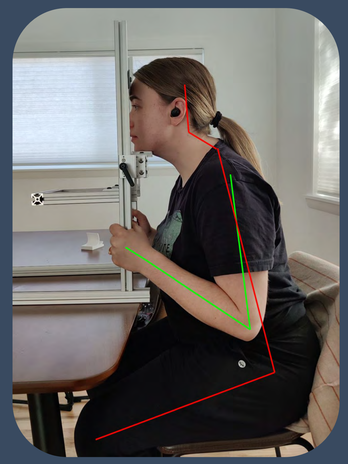
T slot bar utilized in HALO rest

An emphasis on modular design allows for a lightweight, compactable product optimized for quick assembly, and travel.



Universal chin Cup Design

HALO: ERGONOMICS



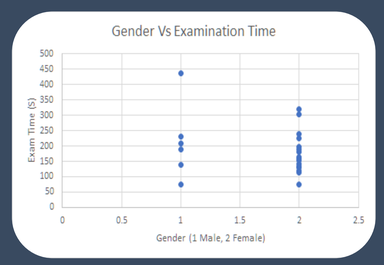
The HALO is projected to serve hundreds of patients on numerous outreach ventures every year. Patient safety is a number one priority to Moran. To assess patient safety, a Rapid Upper Limb Assessment (RULA) was completed to determine whether the HALO would cause any upper body injury. The RULA works on a scale from 1-7 with 1 being the best and 7 being the worst. The HALO achieved a score of 4. Most of the strain on the upper body comes from the neck being in extension and tilted back. To help mitigate this, we redesigned the chin cup to be adjusted forward and back. This allows the cup to be moved to a position where the patient can sit up straighter. This adaptation changed the neck extension angle from 37 degrees to 15. This doesn't decrease the RULA score but does allow additional patient comfort.

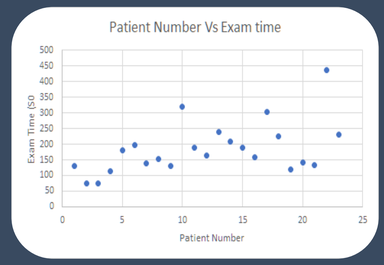
Limb Segment	Angle (degrees)
Upper Arm	15
Lower Arm	122
Wrist	0
Neck	37.2 (Extension)
Torso	25

Angle measurements were taken using the RULA joint angle measuring convention.

RESULTS & CONCLUSIONS

- Total Weight: 8.1 lbs
- Collapsed Dimensions: 23" x 12" x 11"
- Slit lamp adjustment: 7.3" vertical 8" horizontal 8" forward/back





- Minimal fatigue even after numerous examinations
- Female patients no longer have a hard time being examined
- Average exam time is just 3 minutes, allowing for a large number of patients to be examined in a short time frame

ACKNOWLEDGEMENTS

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