

Development of a Gastroschisis Simulation Model to Enable Surgical Task Sharing in Uganda

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BACKGROUND

- **Gastroschisis** is a congenital abdominal wall defect, with **<5% mortality in high-income countries** but **>90% in Uganda**.
- **Timely management** is critical — delays in **resuscitation, transport, and surgical referral** contribute significantly to neonatal mortality in low-resource settings.
- **Simulation-based training** prepares providers to perform life-saving initial management and strengthens neonatal surgical task-sharing.
- However, in low-income countries, training is **limited by the high cost and inaccessibility** of commercial gastroschisis models.

OBJECTIVES

1. **Design and construct** a low-cost, durable gastroschisis simulation model suitable for low-income countries.
2. **Refine the model** through expert feedback to ensure clinical relevance and usability.
3. **Implement and evaluate the model** in a gastroschisis training and management courses for health-care workers in low-income settings.

METHODS

Element	Description
Simulated Bowel	Non-perishable, realistic texture & color; mesenteric attachments
Hollow Abdominal Area	Hollow cavity with right-sided defect; allows bowel protrusion & support
Representative Model	Should resemble newborn infant anatomy
Material Cost	Cost-effective (<\$50), locally sourced materials
Durability	Long-term, repeat use; easily repairable
Portability	Lightweight (<1kg), compact, transportable
Feasibility of Assembly	Easy, time-efficient assembly; scalable production
Suitability for Training	User-friendly, suitable for silo application practice

Table 1. Design criteria for components of model

METHODS

Material	Function	Cost
Mainland's 15.75" teaching doll	Serves as the anatomical base for modeling gastroschisis.	\$35.00
Poly Tubing	Simulates intestinal structure.	\$0.26
Borax Powder	Activates and stabilizes intestinal mixture.	\$0.14
Mesh Fabric	Replicates the mesentery and anchors intestines to the abdominal wall.	\$1.00
Elmer's clear, liquid, washable glue	Main base for creating intestinal texture.	\$1.10
Paint	Colors the intestines to resemble real tissue.	\$0.14
Polyester String	Secures and shapes intestines to the abdominal wall.	\$0.03
Aquagel lubricating jelly	Simulates the slippery texture of intestines.	\$0.17

Table 2. Materials used, functional roles, and cost breakdown

Figure 1. Stepwise construction and assembly of simulation model

Throughout the development process, the prototype was **reviewed** and **tested** by pediatric surgeons in the U.S and Uganda. Their feedback on anatomical accuracy, texture, and usability guided progressive refinements, resulting in the final model.

RESULTS

- **Final model** met design criteria: realistic, durable, portable (800g), and **low-cost (~\$45 USD)**.
- **Over 50 models** were developed, transported, and used to train 160 **midwives, nurses, and residents** in three regions in Uganda, and one in Rwanda.
- **Training outcomes** included improved confidence in silo placement.
- **Users** reported high satisfaction and greater confidence in ability to apply skills in real clinical settings.



Figure 2. Model in use during training programs in Mbarara Regional Referral Hospital, Mbarara, Uganda.

CONCLUSION

- This **low-cost, durable simulation model** is effective for training healthcare providers in Uganda and Rwanda on gastroschisis management.
- The model can be **adapted and scaled** for use in other low-income settings to strengthen neonatal surgical training.
- **Continued implementation and evaluation** can further support task-sharing and help reduce gastroschisis-related mortality.

NEXT STEPS

- **Expand** and incorporate the model into neonatal surgical training programs in Uganda, Rwanda, and other low-income countries.
- Conduct **longitudinal assessments** of training outcomes and **evaluate** the model's **clinical impact** on neonatal survival.