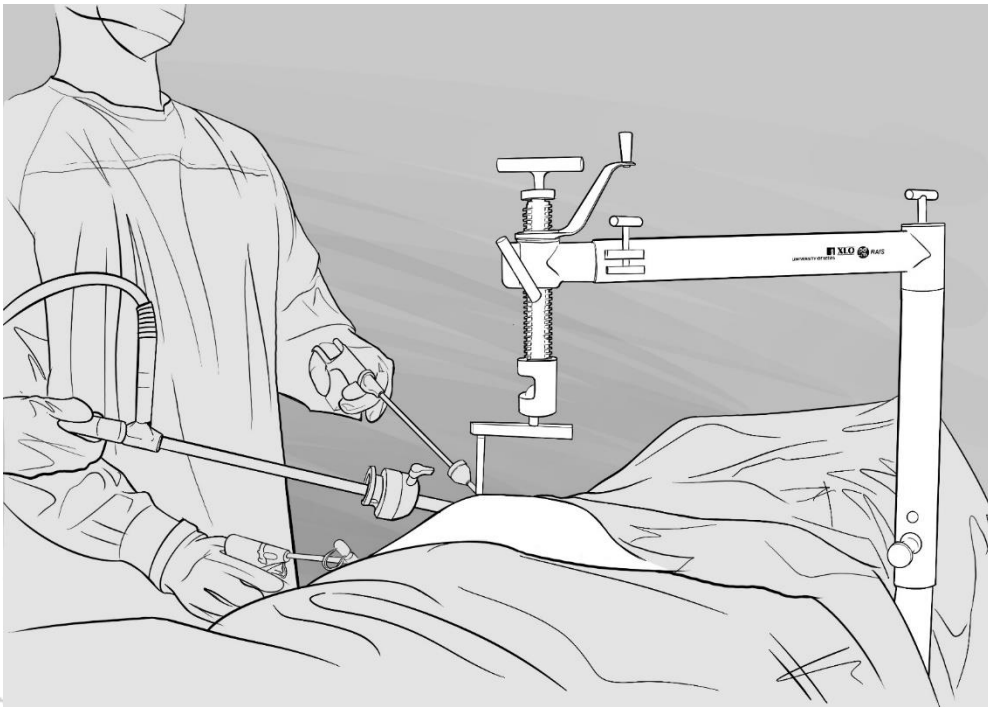


## Retractor for Abdominal Insufflation-less Surgery



### A system bringing modern surgical care to all

RAIS is a surgical lift system, designed to enable laparoscopic surgery in rural or low-resource healthcare facilities. Currently over 5 billion people worldwide lack access to surgery: the RAIS system has been developed in response, by a multidisciplinary team in the UK and India, to improve global access to surgery.

RAIS works by mechanically lifting the abdominal wall, creating a space in the abdominal cavity to conduct laparoscopic surgery. The technique, called GILLS (Gas Insufflation-Less Laparoscopic Surgery) removes the need for general anaesthetic, CO<sub>2</sub> gas and expensive instrumentation which are inaccessible to rural healthcare facilities.

RAIS provides a cost-effective, modern and standards compliant system to enable GILLS and improve patient treatment across the globe.

### A critical need for safe access to surgery

- Surgery is fundamental to modern healthcare, capable of treating **nearly one-third of global disease**.
- Unfortunately, **two-thirds of the world's population** have no access to safe and affordable surgery (over 5 billion worldwide)
- These people typically live in low-to-middle income countries – they lack access to surgical care due to limitations in

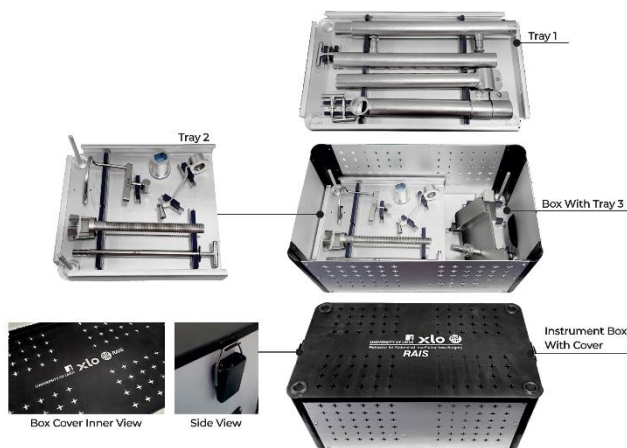
training, infrastructure and equipment.

## Addressing the challenge

- A new technique, Gas Insufflation-Less Laparoscopic Surgery (GILLS) has been developed in India
- It allows laparoscopic (keyhole) surgery to be performed in low-resource settings.
- GILLS brings advantages of laparoscopic surgery
  - Shorter hospital stay
  - Faster recovery time
  - Ability to visualise the abdominal organs without open surgery
  - Fewer complications, especially surgical site infections.
  - Less scarring

## RAIS - a new system to bring GILLS to all

- RAIS provides an innovative and modern solution for surgeons to deliver GILLS
- Developed by a multidisciplinary collaboration across the UK and India [show project partner logos]
- RAIS has been closely designed and evaluated with surgical experts working in low resource areas
- The system is designed to be more intuitive to set up, easy to disassemble to fit in an autoclave, lighter weight and rugged for transportation, improved surgical usability, surgeon-controlled lift and cost effective to manufacture.
- **Portability**
  - Designed to be transported in a compact case
  - Packaged system weighs <10kg and fits airline hand-luggage
- **Surgical Performance**
  - Achieves comparable views to laparoscopic surgery in target procedures
  - Compatible with a range of body sizes
- **Usability**
  - Intuitive and fast configuration of the system
  - Adjustment controlled by surgeon (without need for assistant)
- **Compatibility**
  - Secure attachment to both standard operating tables *and rail-less beds*
  - Designed for sterilisation via flash/standard autoclave
  - A system compatible with a range of autoclaves
  - Robust and easy to maintain
  - Brining excellent surgical performance



## RAIS – making crucial surgery available to all

GILLS enables critical surgical procedures, termed '**Bellwether Procedures**', routinely used for:

- diagnostic laparoscopic procedures
- single-quadrant resection, such as appendectomy, cholecystectomy, salpingectomy, tubal ligation, oophorectomy and myomectomy
- more complex procedures can be performed with appropriate expertise and hospital set-up to ensure patient safety

GILLS is an essential element of the **WHO Compendium of Innovative Health Technologies**.

<https://www.who.int/publications/i/item/9789240032507>

The RAIS device is now featured in the **Open Manual of Surgery in Resource-Limited Settings**

[https://www.vumc.org/global-surgical-atlas/sites/default/files/public\\_files/PDF/Gasless%20Laparoscopy.pdf](https://www.vumc.org/global-surgical-atlas/sites/default/files/public_files/PDF/Gasless%20Laparoscopy.pdf)

## Videos

UK National Institute of Health Research (NIHR) Case-Study on Gasless Surgery:

<https://www.youtube.com/watch?v=33Y21g75IBs>

Videos of RAIS in use – Youtube Channel

<https://www.youtube.com/channel/UCgYHZy1Y3cFSWXOIBbv5RJw>



## Project Team

- Association of Rural Surgeons of India and International Federation of Rural Surgeons, Biru, India: Gnanaraj Jesudian.
- Maulana Azad Medical College, New Delhi, India: Anurag Mishra, Department of Surgery, Lovenish Bains, Department of Surgery.
- Medical Aid International, Mr Tim Beacon.
- Ortho Life Systems, New Delhi, India: Sundeep Singh Sawhney, Tamandeep Singh Kochhar.
- Pd-m International Ltd, Thirsk, UK: Philippa Bridges, Richard Hall.
- University of Leeds and Leeds Teaching Hospitals Trust, UK: Noel Aruparayil, Cheryl Harris
- University of Leeds, UK: Pete Culmer, Millie Marriott Webb (School of Mechanical Engineering)

## Publications

**Five billion people can't afford surgery – a team of innovators could soon change this**

<https://theconversation.com/five-billion-people-cant-afford-surgery-a-team-of-innovators-could-soon-change-this-185081>

**India Economic Times: Leeds University calls for developing medical devices specifically for LMICs**

<https://health.economictimes.indiatimes.com/news/industry/leeds-university-calls-for-developing-medical-devices-specifically-for-lmics/92416920?redirect=1>

**The RAIS Device for Global Surgery: Using a Participatory Design Approach to Navigate the Translational Pathway to Clinical Use**

Webb MM, Bridges P, Aruparayil N, Chugh C, Beacon T, Singh T, Sawhney SS, Bains L, Hall R, Jayne D, Gnanaraj J. The RAIS

Device for Global Surgery: Using a Participatory Design Approach to Navigate the Translational Pathway to Clinical Use. IEEE Journal of Translational Engineering in Health and Medicine. 2022 May 23;10:1-2.  
<https://ieeexplore.ieee.org/document/9780179>

**Cost-effectiveness of gasless laparoscopy as a means to increase provision of minimally invasive surgery for abdominal conditions in rural North-East India**

Dawkins, B., Aruparayil, N., Ensor, T., Gnanaraj, J., Brown, J., Jayne, D. and Shinkins, B., 2022. Cost-effectiveness of gasless laparoscopy as a means to increase provision of minimally invasive surgery for abdominal conditions in rural North-East India. PLoS one, 17(8), p.e0271559.  
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0271559>

**Training programme in gasless laparoscopy for rural surgeons of India (TARGET study)-Observational feasibility study.**

Aruparayil, N., Gnanaraj, J., Maiti, S., Chauhan, M., Quyn, A., Mishra, A., Bains, L., Mathew, G., Harris, C., Cundill, B. and Fellows, A., 2021. Training programme in gasless laparoscopy for rural surgeons of India (TARGET study)-Observational feasibility study. International journal of surgery open, 35, p.100399.  
<https://www.sciencedirect.com/science/article/pii/S2405857221000905>

Aruparayil, N., Gnanaraj, J., Maiti, S., Chauhan, M., Quyn, A., Mishra, A., Bains, L., Mathew, G., Harris, C., Cundill, B. and Fellows, A., 2021. Training programme in gasless laparoscopy for rural surgeons of India (TARGET study)-Observational feasibility study. International journal of surgery open, 35, p.100399.  
<https://www.sciencedirect.com/science/article/pii/S1072751520320986>

Webb, M.M., Bridges, P., Aruparayil, N., Mishra, A., Bains, L., Hall, R., Gnanaraj, J. and Culmer, P., 2021. Designing devices for global surgery: evaluation of participatory and frugal design methods. IJS Global Health, 4(1), p.e50.  
[https://journals.lww.com/ijsglh/Fulltext/2021/01010/Designing\\_devices\\_for\\_global\\_surgery\\_evaluation.7.aspx?context=LatestArticles](https://journals.lww.com/ijsglh/Fulltext/2021/01010/Designing_devices_for_global_surgery_evaluation.7.aspx?context=LatestArticles)

## Images



Configuration of the RAIS device to create a surgical operative space (JSS Medical College, India)



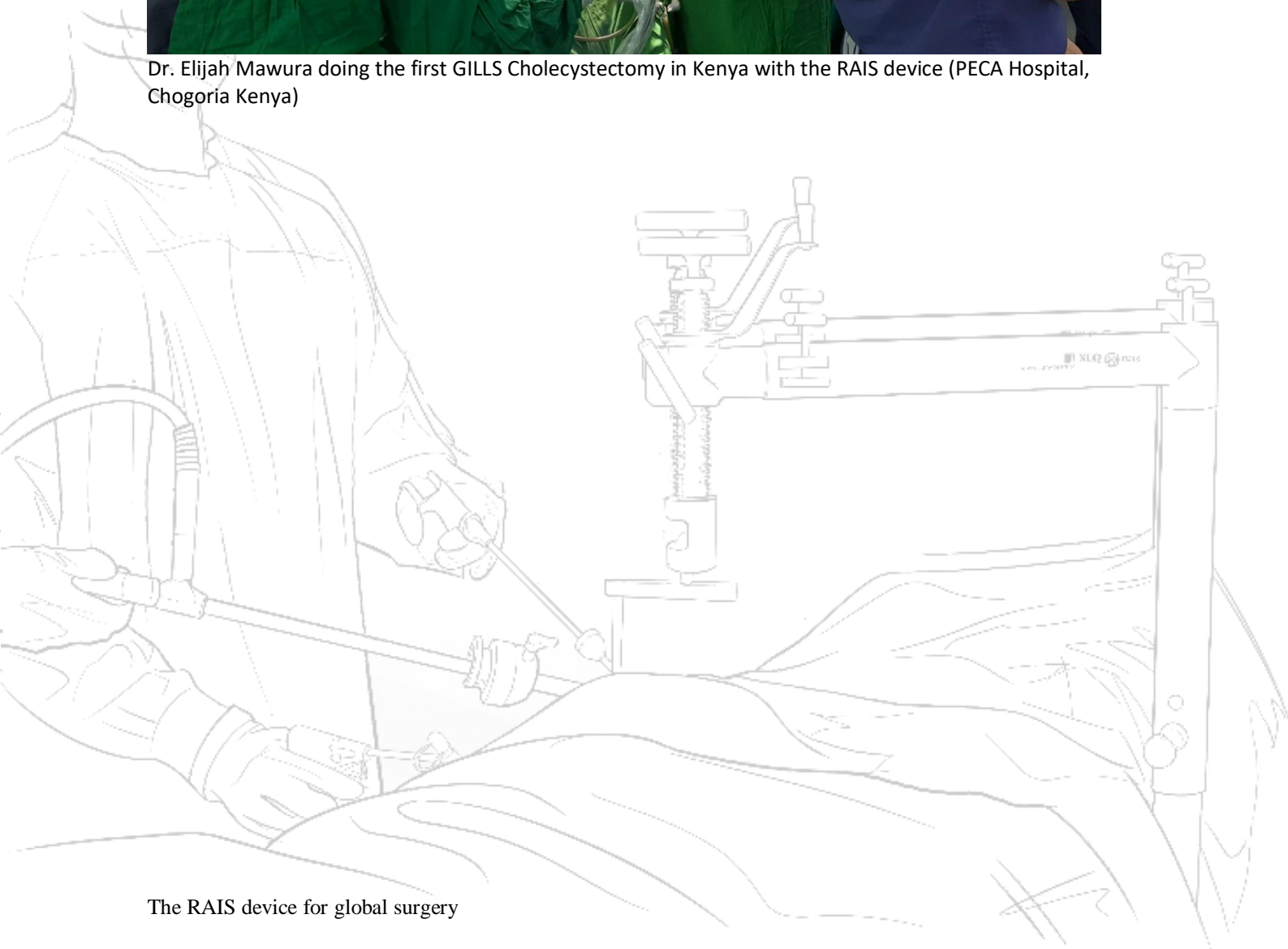
Inserting surgical ports to facilitate a gas-insufflation-less laparoscopic procedure (Martin Luther Christian University, India)



A surgical procedure using the RAIS device (Martin Luther Christian University, India)



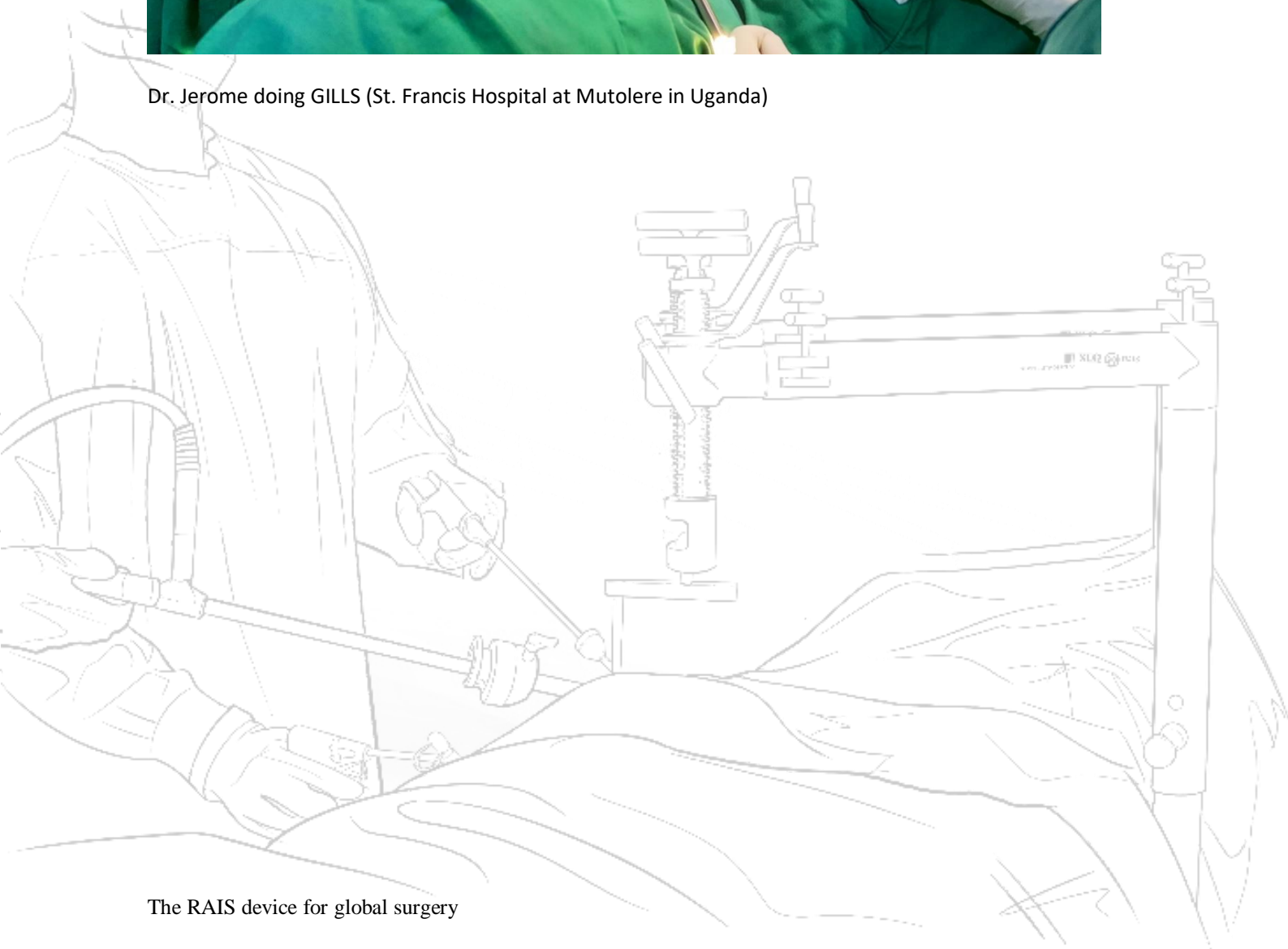
Dr. Elijah Mawura doing the first GILLS Cholecystectomy in Kenya with the RAIS device (PECA Hospital, Chogoria Kenya)



The RAIS device for global surgery



Dr. Jerome doing GILLS (St. Francis Hospital at Mutolere in Uganda)



The RAIS device for global surgery