

# RURAL SURGERY IN INDIA -FRUGAL INNOVATIONS

**Dr. Gnanaraj Jesudian MS, MCh (Urology), FICS, FIAGES, FARSI**  
Consultant Surgeon  
Secretary of the International Federation of Rural Surgeons  
Past President of Association of Rural Surgeons of India.



## KEY POINTS

The Primary concerns of Rural Surgeons are Safety and Cost Reduction. Without the frugal innovations it would be difficult to provide affordable surgical Care. Low – Cost Innovations like Mosquito Net Mesh for Hernia Repair, locally made Endo – Loop have dramatically reduced the cost of Disposables.

Jugaad Innovations like Generator from automobile engines, vehicle head lamps as OR lights, etc., are seen in most of the rural Operating Rooms. The Gas Insufflation Less Laparoscopic surgeries and the Laptop Cystoscope have taken the Specialist surgeries to rural and remote areas. Innovations like the “Easy Position Easy Fix” stirrups offer superior advantages over the commercial alternatives. Low – Cost suture aid helps in improving the quality and there are several techniques that are relevant to rural surgery. Some of them have been endorsed by the World Health Organization and all of them by the International Federation of Rural Surgeons.

## INTRODUCTION

The rural areas of India have about 70,000 In – Patient beds in mission hospitals and these hospitals are the primary Surgical Care providers in rural and remote areas other than the Government facilities. Several Frugal Innovations have helped these hospitals provide high quality surgical care at affordable cost and the same spirit of innovation helped them to survive the current Pandemic <sup>1</sup>. The Association of Rural Surgeons of India [<https://www.arsi-india.org/>] and the International Federation of Rural Surgeons [<https://ifrs.site/>] are involved in evaluating and endorsing several Frugal innovations that helped the Rural Surgeons.

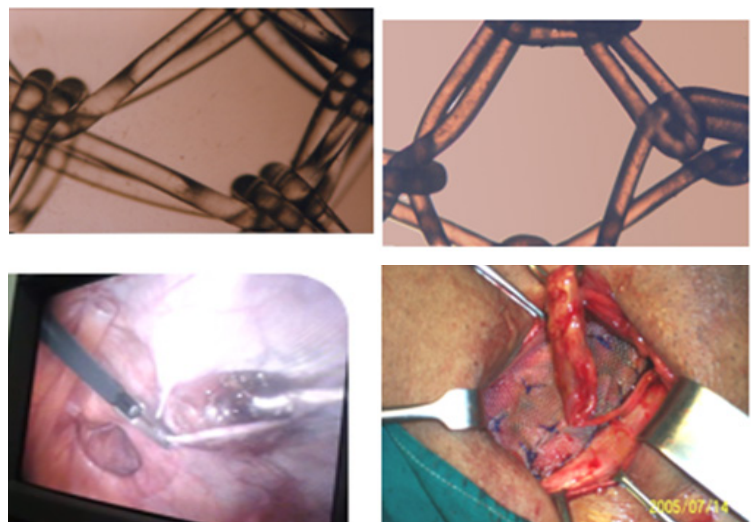
The primary concern of the Rural Surgeon is the safety of the Patient. Unlike the large Hospitals in urban areas any news about complications spread very quickly in rural areas and would adversely affect the surgeons. Lowering the costs to make surgeries affordable for the poor and the marginalized is the second major concern of the rural surgeons.

We will have a look at what drives these innovations among rural surgeons in India.

## THE LOW-COST INNOVATIONS

We will start with a famous one. The use of Mosquito net for tension free hernia repair is listed as one of the 6 famous, effective, and low – cost innovations in Surgery by the WHO <sup>2</sup>.

**Figure 1: Mosquito net used as Mesh in Open & Laparoscopic Hernia repairs**



The percussor to this was the use of Fish Net Nylon sutures instead of the commercial Monofilament Nylon sutures. The Prolene mesh and Mosquito net have Polypropylene and mosquito net has varying amounts of Polyethylene while Prolene mesh has Polydioxanone. Although several other such low-cost innovations are available this was one that is of such dramatic reduction in cost (3000-fold reduction) and has several publications including meta - analysis and Randomized Control trials.

It is important for rural surgeons to keep looking out for less expensive alternatives. For example, commercial Endo

-Loops are useful in Laparoscopic Surgeries. They are also quite easy to make in the Operating Room with the locally available materials<sup>3</sup>.

**THE JUGAAD INNOVATIONS**

India is a land of Jugaad Innovations. The rural Operating Rooms are filled with such Jugaad innovations as shown in Figure 2. The standby power generator is often made from second - hand vehicle engines. The OR light is from head lamps of old cars. The Industrial Oxygen is standard in rural areas as they are less expensive and have larger capacity.

**Figure 2: The Jugaad Innovations in the Operating Room**



**INNOVATIONS FOR SAFETY & COST REDUCTION**

The recent Pandemic has taught us that it is safer to offer surgeries at the local level than having them centralized in the name of improving the quality. One such innovation that makes surgeries possible in rural areas and at the same time makes it safer is the Gas Insufflation Less Laparoscopic Surgeries [GILLS]<sup>4</sup>. This innovation also finds a place in the WHO compendium of Medical Devices for Resource poor setting. Figure 3 shows the first-generation device.

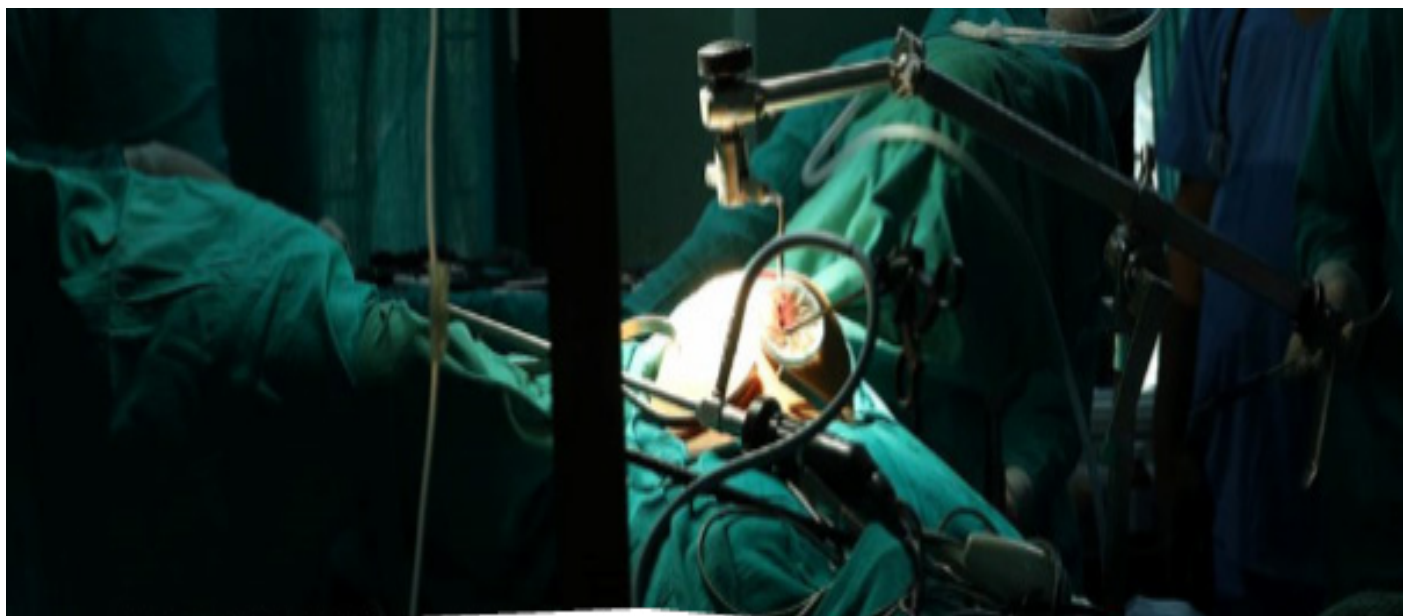
With the device Laparoscopic Surgeries are possible under less expensive and easily available Spinal Anaesthesia. The Complications of port insertions and gas insufflation and the physiological changes due to the gas and the complication

related to anaesthesia are not there too. Reverse Engineering and altering the requirements to reduce the cost was used for creating a low - cost vacuum therapy unit for the non - healing wounds and adding other features required for India<sup>5</sup>.

**RURAL SURGERY SPECIFIC INNOVATIONS**

Some innovations are specific for rural areas as they might not have much relevance in Urban areas. The Newon Ventilator can run on electric power, compressed air or can be operated mechanically (<http://mdcurrent.in/practice-management/how-to-reduce-cost-in-rural-hospitals-presented-at-the-ifrs-meeting-by-dr-r-r-tongaonkar/>) in addition to costing less than 20% the cost of standard ventilators.

**Figure 3: Gas Insufflation Less Laparoscopic Surgery Device**



The Laptop Cystoscope (<https://www.youtube.com/watch?v=7AbhIn2ZAwl>) is another innovation that is specific for rural areas. It helps in diagnosing and treating about 50% of the Urology patients that a rural surgeon might see (Figure 4). The investment for the equipment is less than 10% of the set up that is required for the currently available equipment.

### THE SUPERIOR INNOVATIONS

Some of the innovations are superior to the conventional equipment like the GILLS equipment, which is better for learning, for doing Single Incision Surgeries and better during the Pandemic because it is isobaric rather than high pressure system. Another innovation that provided superior quality in terms of positioning possibilities is the "Easy Position Easy Fix Stirrups that won the Prestigious Lockheed Martin award given by the Department of Science and Technology of the Indian Government [<http://mdcurrent.in/press-releases/lockheed-martin-award-innovative-easy-positioneasy-fix-stirrups/>].

### IMPROVING QUALITY

Some innovations from Rural Surgeons help improve the quality of surgical care like the use of hypodermic needle as a suture guide during vasovasostomy<sup>6</sup> and the further development of a useful suture guide by Dr. Sukumar Maiti ([https://www.youtube.com/watch?v=9RAkH2\\_yvec](https://www.youtube.com/watch?v=9RAkH2_yvec)).

### EMERGENCY INNOVATIONS

Getting Gas and Power supply sorted out is difficult in rural areas. For example, during Laparoscopic surgeries in a rural hospital we ran out of carbon di oxide gas because of a leak that was not detected earlier. We used the Nitrous Oxide gas from the Anaesthesia Machine instead of carbon di oxide. With little experimenting we were able to work out letting in the gas at the desired pressure (<http://mdcurrent.in/surgery/no-gas-laparoscopic-surgery-rural-areas/>).

Sometimes when there is no power supply both the regular and spare Generators fail. During such a time we found that use of torch light is sufficient to complete small Urology procedures like DJ stent removals. We had to go back to the old ways of directly looking into the Cystoscope instead of having the help of Camera and monitor.

However, prior to this when the power failed, we were halfway through Laparoscopic Appendectomy and we completed it using the torch light for connecting to the light cord and using the Cell phone camera for doing the surgery.

### INNOVATIVE TECHNIQUES

Over the years the rural surgeons have also developed innovative surgical techniques that use the available equipment instead of the expensive ones like the following;

1. Renal Stone removal through the normal urinary passage [<http://mdcurrent.in/primary-care/innovative-cost-effective-treatment-renal-stones-remote-areas-surgical-services-initiative/>]
2. Core through Urethrotomy [ <http://mdcurrent.in/urology/core-blind-endoscopic-internal-urethrotomy-regular-self-calibration-cost-effective-option-rural-areas/>]
3. Hernia repair [ <http://mdcurrent.in/primary-care/>]

Figure 4: The Laptop Cystoscope



[small-incisional-hernia-repair-low-cost-minimally-invasive-technique-for-rural-areas/](https://www.thinkglobalhealth.org/article/whos-unheralded-role-surgery)

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*Dr. Gnanaraj Jesudian MS, MCh (Urology), FICS, FIAGES, FARSI*

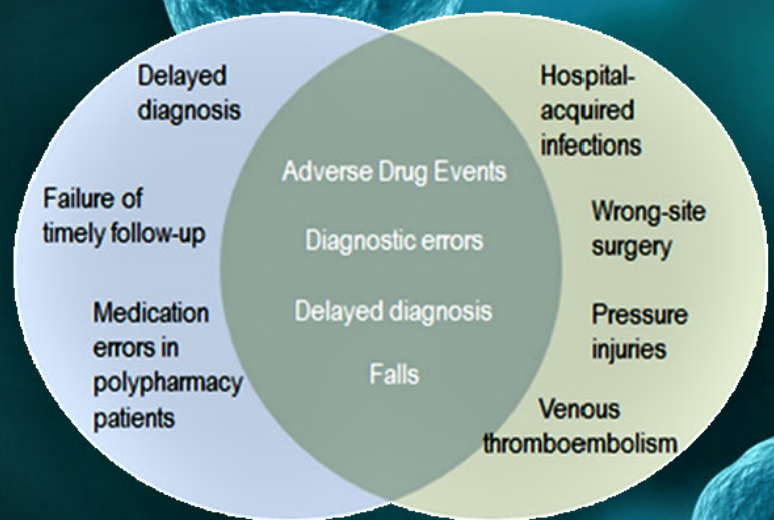
Dr. Gnanaraj became interested in Rural Surgery after visiting the Kukna Tribals in Dangs District of Gujarat during his undergraduate days in CMC Vellore. During the last 3 decades he helped 63 hospitals in rural areas start Minimally Invasive Surgeries. He has over 350 publications in National and International Journals about rural surgery and has few innovation awards including the Lockheed Martin award of the Department of Science and Technology of the Indian Government. He is currently the Secretary of the International Federation of Rural Surgeons and Past President of Association of Rural Surgeons of India.

# Improve patient safety by eliminating adverse events in health care settings

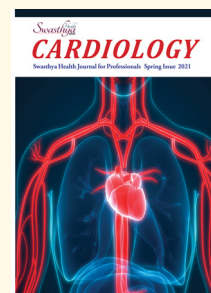
It is estimated that every year more than 300,000 patients acquire a healthcare associated infection (HCAI, HAI or nosocomial infection) as a result of care with in the NHS.

Primary and ambulatory care

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