

# Innovations in Neonatology for affordable care

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The reasonable man adapts himself to the world;  
the unreasonable one persists in trying to adapt  
the world to himself. Therefore, all progress  
depends on the unreasonable man.

- George Bernard Shaw

Minds are like parachutes; they work best when open.

- T. Dewar

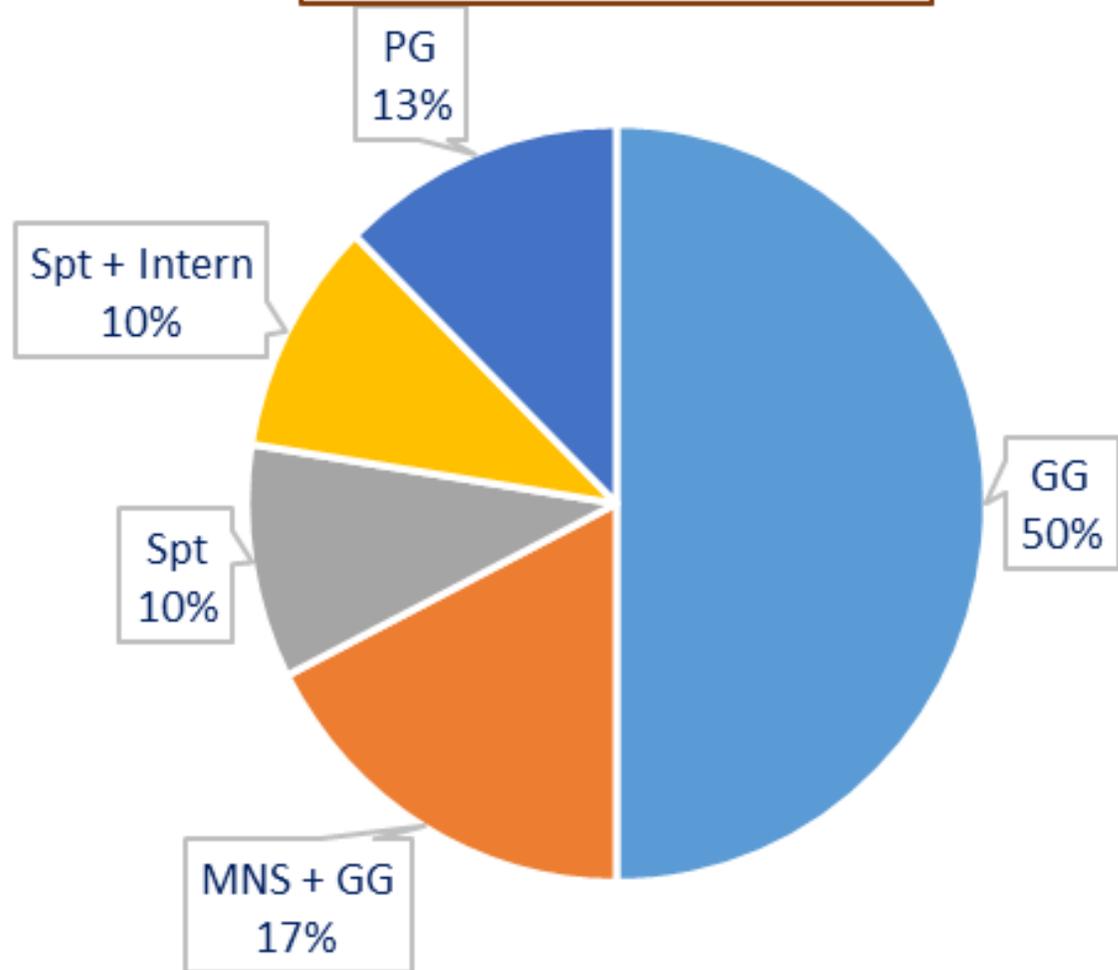
# Ontogeny of Innovation

- Tight corner
- Innovation/ Research Question
- Innovative idea
- Innovation development
- Trials : Experimental, Clinical
- Patenting
- Put to Practice

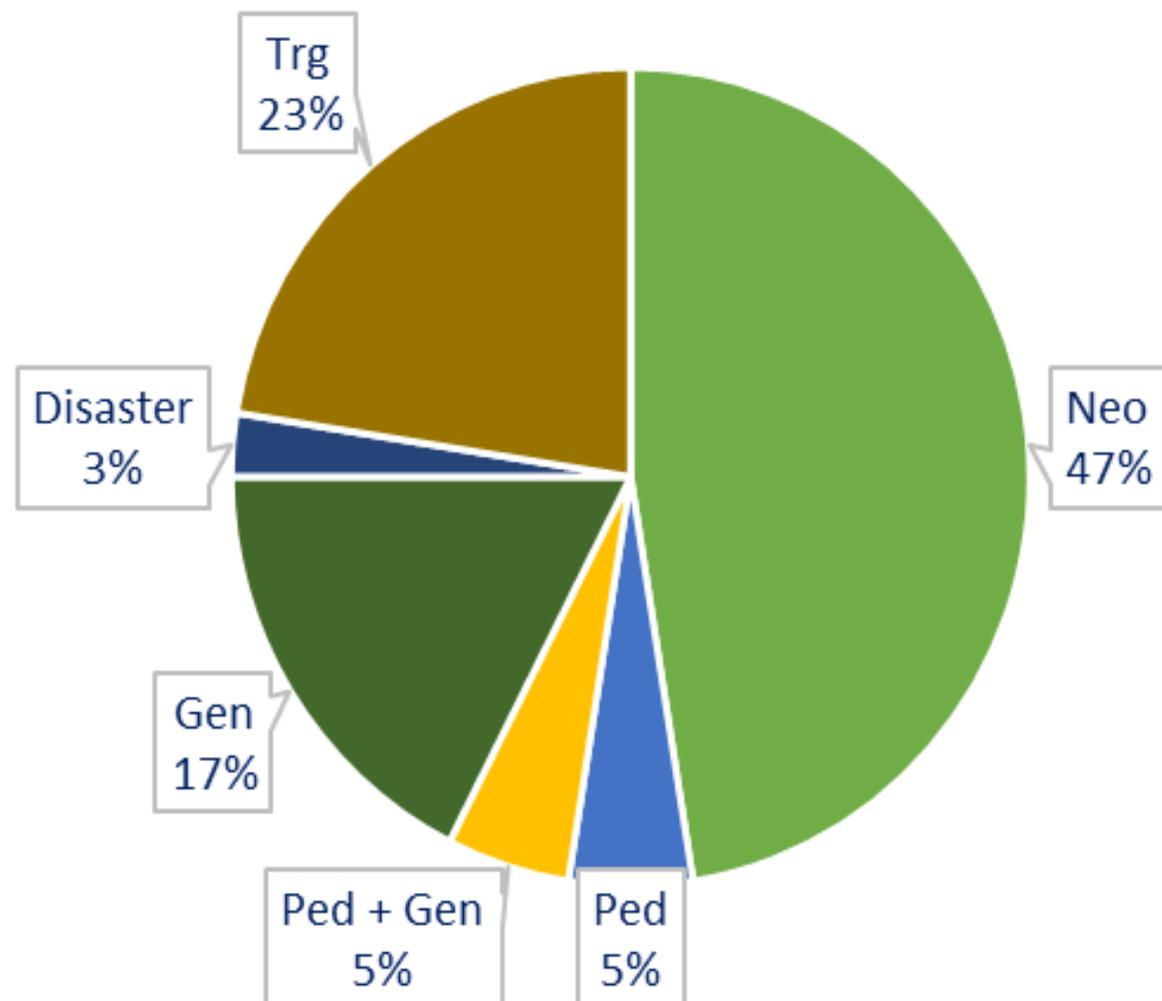
# Attributes of Innovations?

- Essentiality
- Relevance
- Tailor-made
- Cost effective
- Exciting / Addictive

## Contributors (n= 40)



## Domainwise Distribution of Innovations (n=40)



# Respiratory Care

# Girisam Endotracheal & Auxiliary Tube (ETAT) Fixator

**Problem:** Skin abrasions/ Sepsis

**Research Question (RQ):**

Safe , atraumatic , effective fixation of ET tube?

Yr-1995





# Warmidified Oxygen

## Problem:

Cold O<sub>2</sub> unfriendly to lungs

## RQ:

If Warmidified O<sub>2</sub> during Ventilation, then  
why not during routine O<sub>2</sub> delivery?

Yr 1996



# Endotracheal Tube Aspirator

## Background:

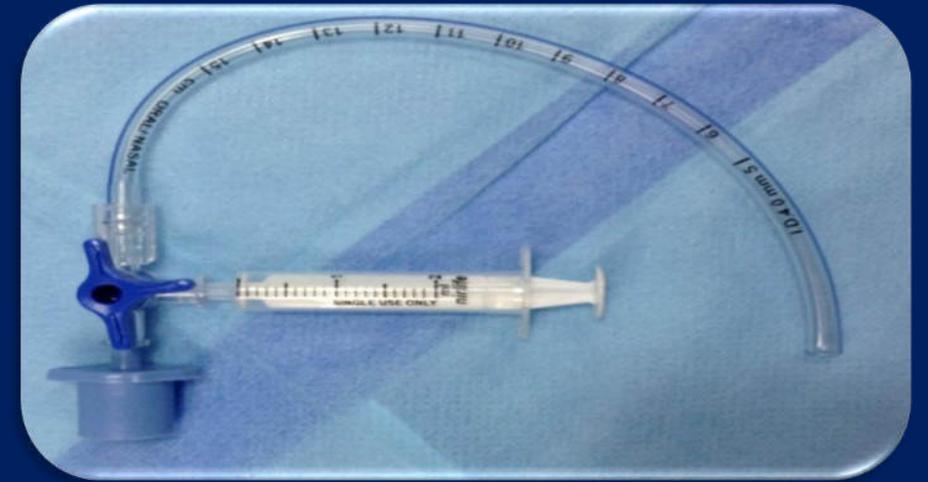
Repeated ET insertions to aspirate meconium, a risky & traumatic practice

## RQ:

Is there any way to avoid repeated intubation in MSL & depressed baby at birth?

Best Innovation Award

Yr 2000



Gp Capt S Patnaik

# Water trap for humidified oxygen through oxygen hood

## Background

Water dripping on baby's face

## RQ:

How to prevent water dripping on the face of the baby during Humidified Oxygen therapy?

Yr 2000



CARDIOVASCULAR

# Head Pulse-oximetry

- **Background:** Ineffective readings if poor perfusion or arm bandages
- **RQ:**
- Could we use available pulse-oximeter probe for head pulse-oximetry?
- Pilot work
- Year 2000



# “Asvini Formula” for Inotropes

- **Background:** Due to complicated calculation & urgent scenarios, likelihood of wrong quantity of drug infusion
- **RQ:** Simpler Calculation?
- **1 mg/kg** of Dopamine
  - Added in 6hrs infusate volume  
 $2.7 \mu\text{g/kg/mt}$  (~ 2.5)
  - Added in 8 hrs infusate volume  
 $2.1 \mu\text{g/kg /mt}$  (~ 2.0)

Year 1996

# Calf Sign : PDA

## Background:

- To find significant PDA one needs to do echo

## RQ:

- To find out clinical markers to diagnose hemodynamically significant PDA.

## Innovation:

- Pulsations at calf as shown
- Calf sign indicates significant shunt



# Gopigirisam IV fixator



- **Background** : Frequent firing because of ineffective fixation & Thrombophlebitis
- **RQ**: ? Any device to minimize both issues



# Use of pulse oximeter probe for visualization of vessels for cannulation



Gp Capt S Dalal

Asepsis

# Alcohol Dispenser for Hand disinfection

## Background:

Higher incidence of infection

## RQ:

How to reinforce hand disinfection in economic & feasible manner?

Year 1995



# Aseptic Intake Output Chart

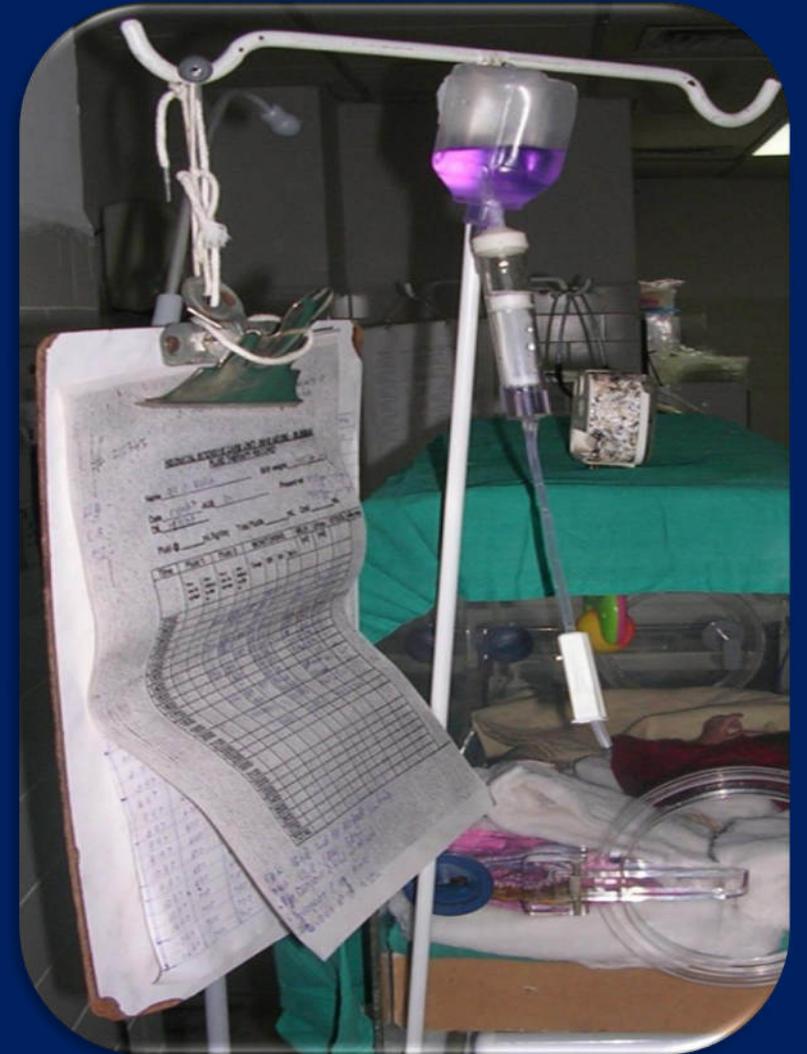
## Background:

Higher incidence of infection

## RQ:

How to provide intake output charts at bedside without compromising asepsis?

Year 1995



# IV fluid bottle contamination prevention envelope

**Background:** Higher incidence of infection

**RQ:** Measures to reduce sepsis



# Betadine usage at all breaks in Intravenous fluid line

- **Background:** Higher incidence of infection
- **RQ:** Measures to reduce sepsis



# Jaundice Management

# Effective Jaundice Management

## Background:

- Ineffective units, Frequent DVET
- Kernicterus

## RQs :

1. Can the Conventional Phototherapy be made more effective?
2. Can entero-hepatic bilirubin reabsorption be more effectively prevented?

# Phototherapy with cloth flaps



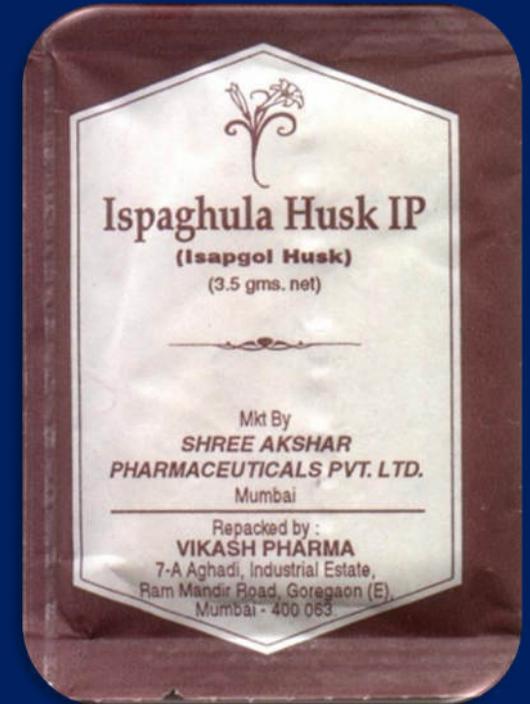
Year  
2001

# A path breaking Phototherapy unit



# Ispaghul husk in Neonatal Jaundice

Reduces entero-hepatic recirculation of Bilirubin



# Routine care Neonates

## Built in Weighing Scale

- ▣ Year 1994
- ▣ Open care system with built in weighing scale
- ▣ Extremely useful
- ▣ Essential

# Hypothermia : Heat Shields

## **Background:**

Heat Shields : Cost, Availability

## **RQ:**

Could we innovate one which is free, easily available, disinfectable, disposable?

# Heat shield for neonates

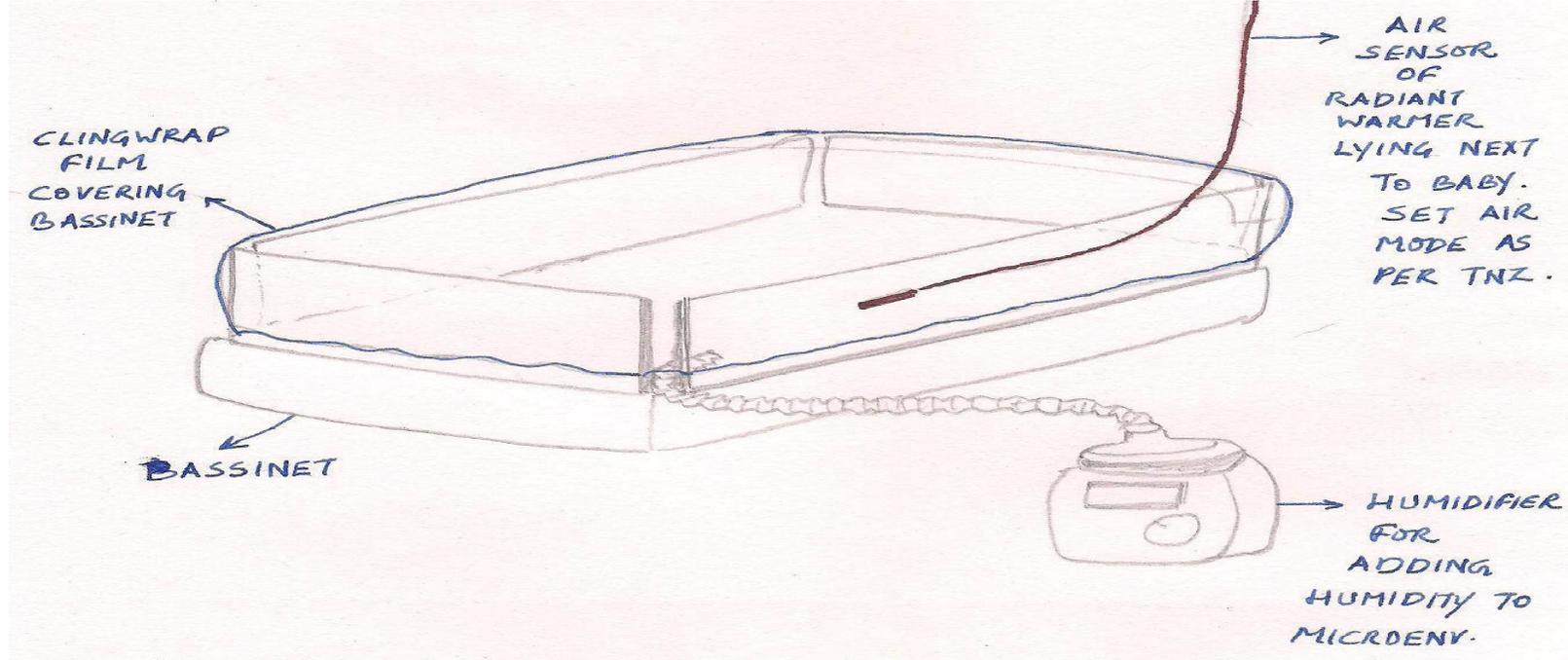


# Transport Incubator

- ▣ **Background:** Cumbersome, battery operated heating, costly devices
- ▣ **RQ:** Simple, light, disinfectable, nonbattery or electricity operated , All modes of transport
- ▣ **Best Innovation award** Yr 1996



# Open-care converted as an Incubator



Col Vishal Tewari



# Feeding Transition

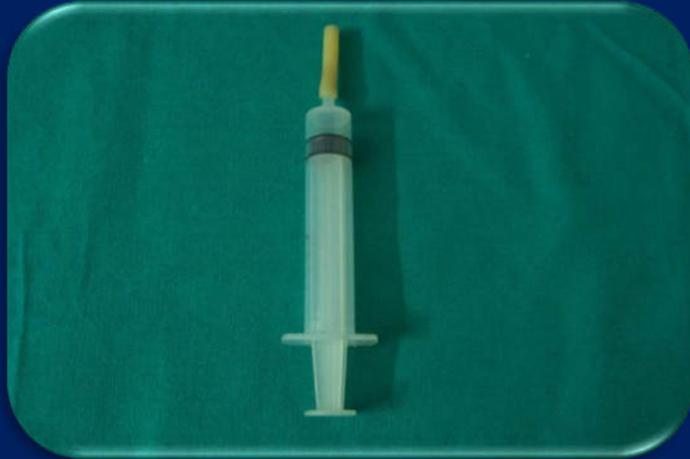
## ➤ **Background:**

- Issue transition from Gavage to Nipple feeds
- Various practices addressing to Suck & Swallow Coordination, Volume of feed, Control by baby etc?

## ➤ **RQ:**

- Is there any method which addresses to above variables effectively ?

# Syringe Feeding



# Clinical Volumetry

## ➤ **Background:**

- Issues with measuring volumes for various body fluids which are getting continuously drained?

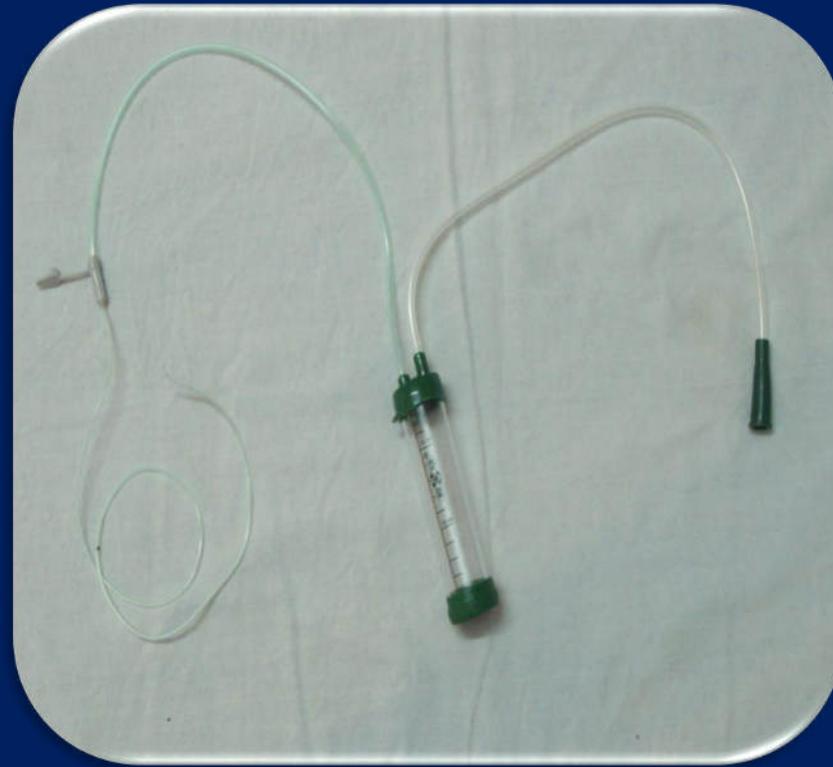
## ➤ **RQ:**

- Could we have inexpensive/ disposable volumetric collector device for various body fluids?

## ➤ **Innovation:**

- Used Mucus traps
- Nurse's initiatives

# Girisuz Gastric continuous aspirate volumetric collector



# Mucous Trap for Urinary Volumetry



# Proactive Developmentally Supportive NICU care

Background: Multiple disabilities in NICU graduates



# Effects of musical intervention on vital parameters of neonates a clinical trial

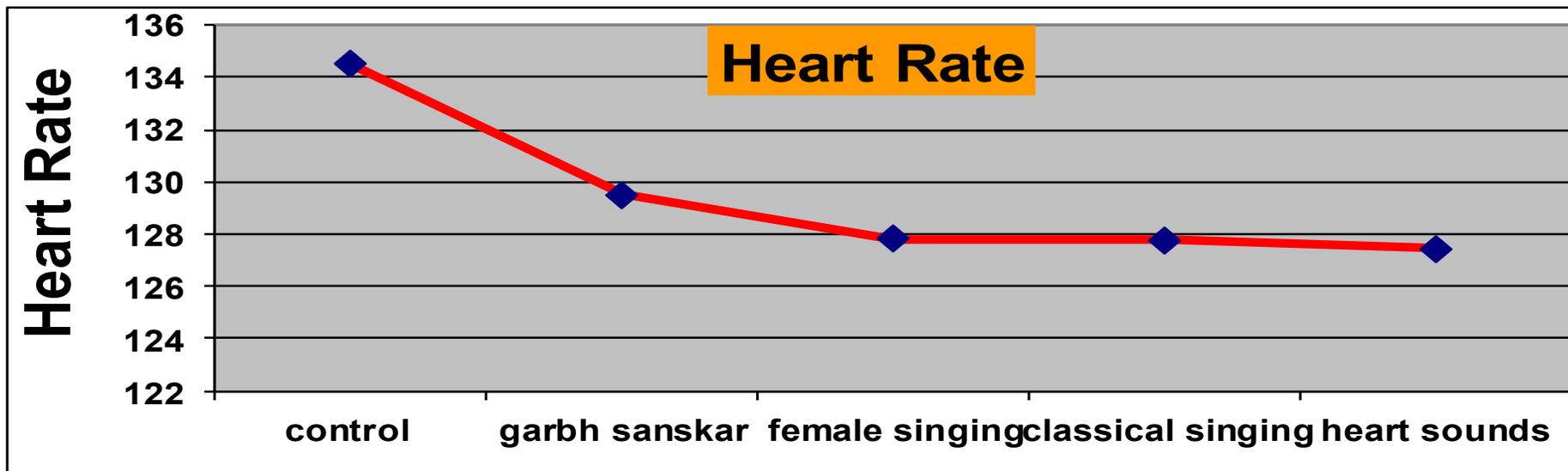
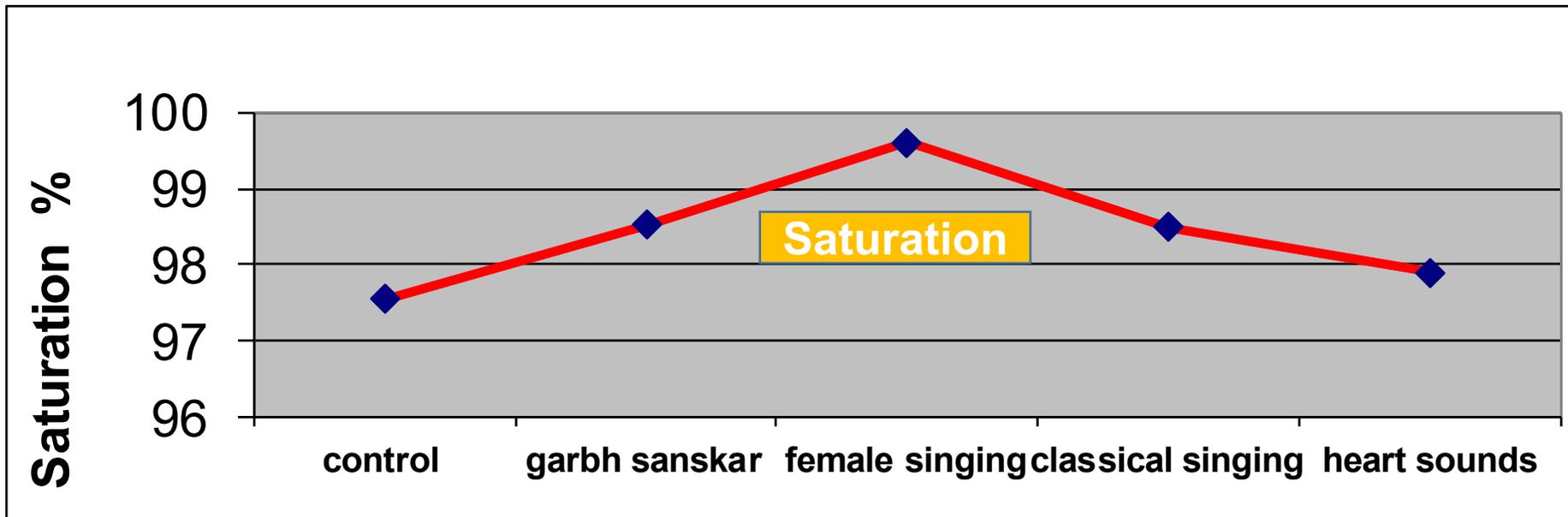
## Types of music

Garbh-sanskar music

Female singing voice

Classical instrumental music

Recorded human heart sounds with  
background of lullabies



# Sound Pressure Levels in NICU

- Decibel 10<sup>th</sup> : App for measuring NICU Noise

# Ankle Foot Length Meter



**Yadav AK, Gupta G. Use of modified Ankle Foot Length Meter for anthropometric examination of newborns, 11-14 Dec 08 NNF 2008**

# Galactose free formula

- Research Q
- Peanut Milk
- Mushroom Milk
- (Galactose < 0.1 mg per 100 g of tissue in mushroom & peanut)
- Year 1995

# Training innovations

# Training

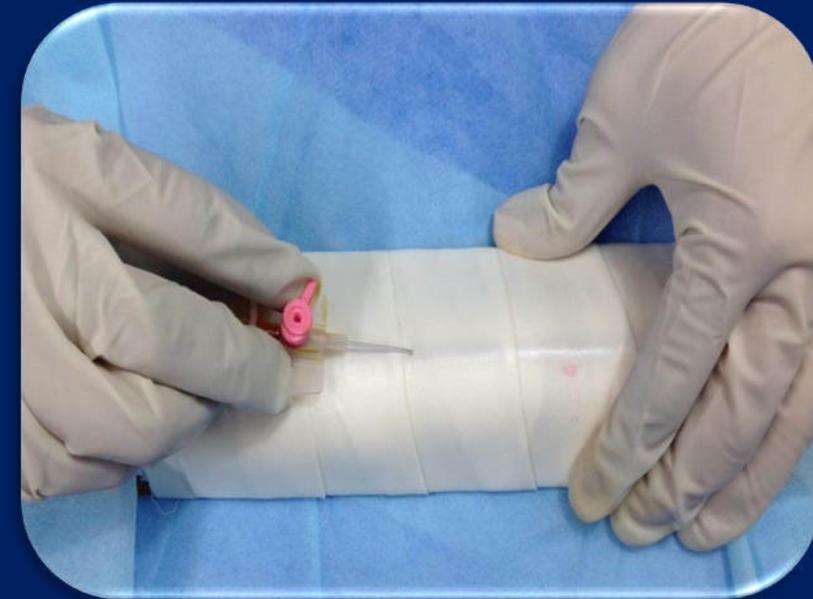
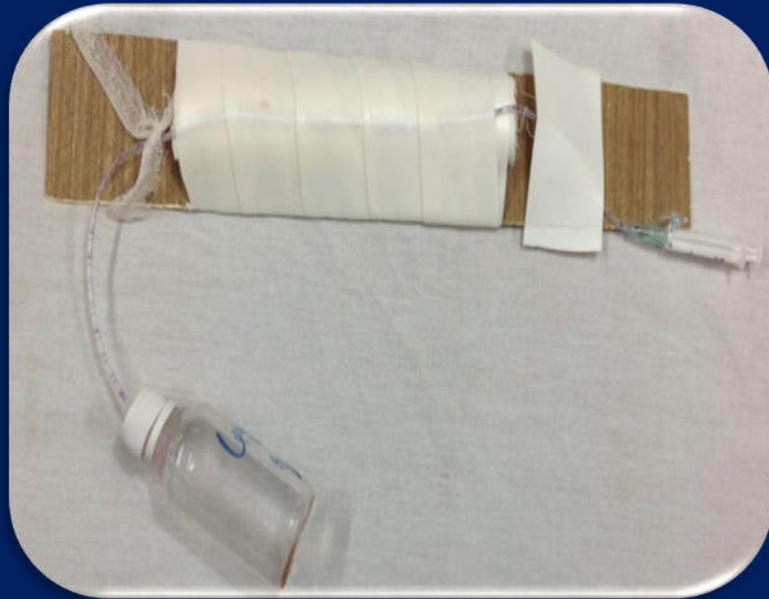
## Background:

- Difficulties in acquiring skills on human subjects, need of simulators, which are either not available or costly.

## RQ:

- Could we develop simple affordable simulators for various skills?

# PICC Insertion trainer



Surg Capt R Koshi

PICC is inserted through the stem of the cannula



Gp Capt S Dalal

# Intra-osseous Trainer

- Mutton leg

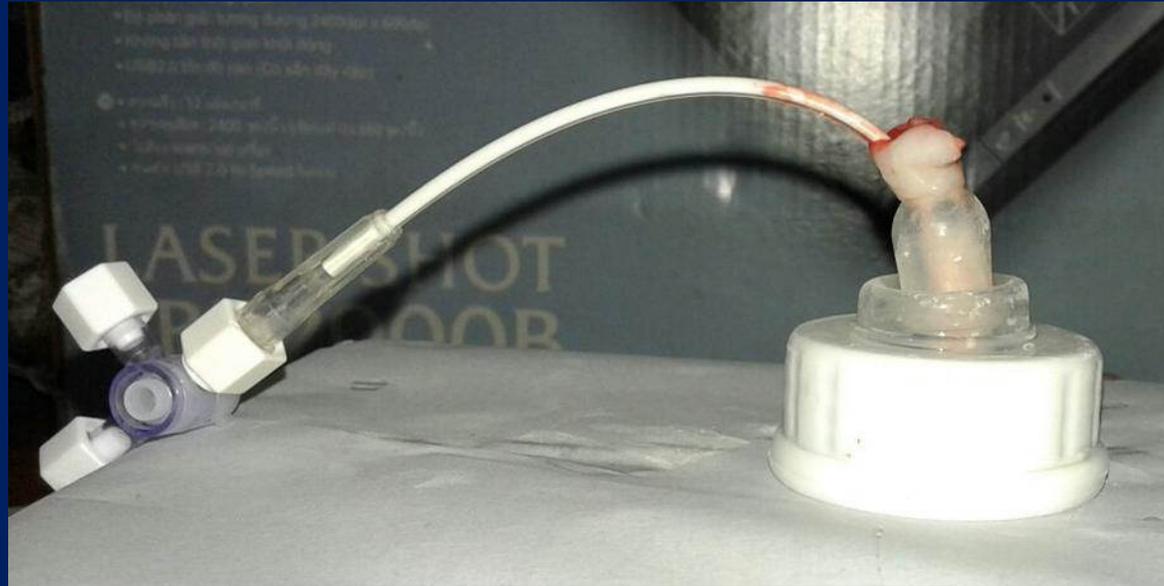
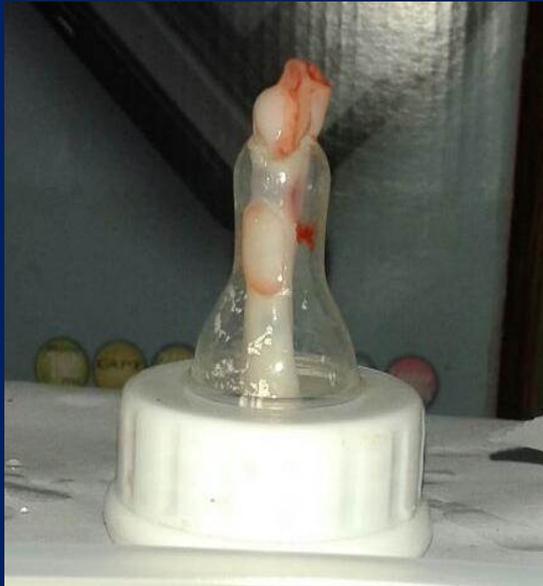


# Umbilical Vessels Catheterization trainer



Surg Capt Ashok Yadav

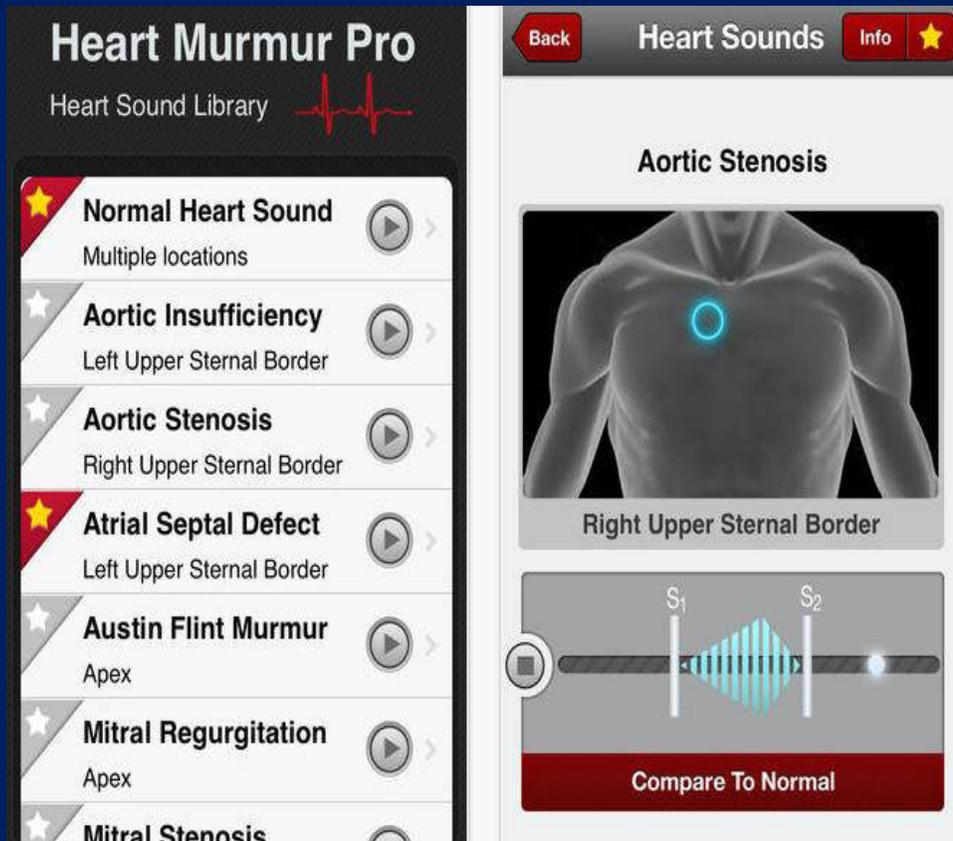
# Umbilical Vessels Catheterization trainer



Gp Capt S Dalal

# Innovative Examinations

- **Background** : Difficulty in getting Cardiac cases for examinations.
- **Innovation**: Med apps on Smartphones used in MD Pediatric exam



## Some Other Published Innovations

- Occluded ear simulator
- Simulation of Neonatal Nurse's training
- Simulator of Mechanical Ventilators
- Non-animal simulation trainer for chest tube insertion in Neonates
- Simulations of prenatal maternal sound in NICU incubators
- Cling wrap AIIMS trial
- Low cost Incubators
- Sion's Glucose Infusion Formula

# Presentation

## ➤ RQ:

➤ Bulky Laptop, CDs, Pen drive, Less Convenient

➤ Viruses

➤ Presentation opening

## ➤ Innovation:

➤ Smartphone based Presentation

# Publications

- Observational studies on open source data analysis
- Pubmed, Cochrane, YouTube etc.

# How much proactive Pubmed Innovations?

## ➤ Key words :

- Innovations & Neonatology : 4 Pubs, not appropriate
- Innovations & Newborn & care : 2 Pubs, not appropriate
- Innovations Neonatology : 4 Pubs, 1 on incubator development
- Innovative & Neonatal Practices : Nil
- Innovative & Neonatal equipment : 47 Pubs, 17 relevant

# Issues

- No central registry
- Lack of publicity
- Process of patenting

# Way ahead

- Central repository
- Journals: Special section
- Awards : Motivation
- Conferences
- Sessions : In conferences
- Websites
- Discussion groups
- Easier Patenting
- Inclusion of Innovation & Patents in syllabi of Medical & Nursing education

# Conclusions

- Essential & Extremely relevant
- Dissemination mandatory
- Facilitatory attitude
- Guarantees Self sufficiency

# Balance sheet

## Acquired (Credit)

- Parents
- Teachers
- People
- Government
- Literature
- Equipment
- Misc

## Paid back

- ? Literature
- ? Equipment development

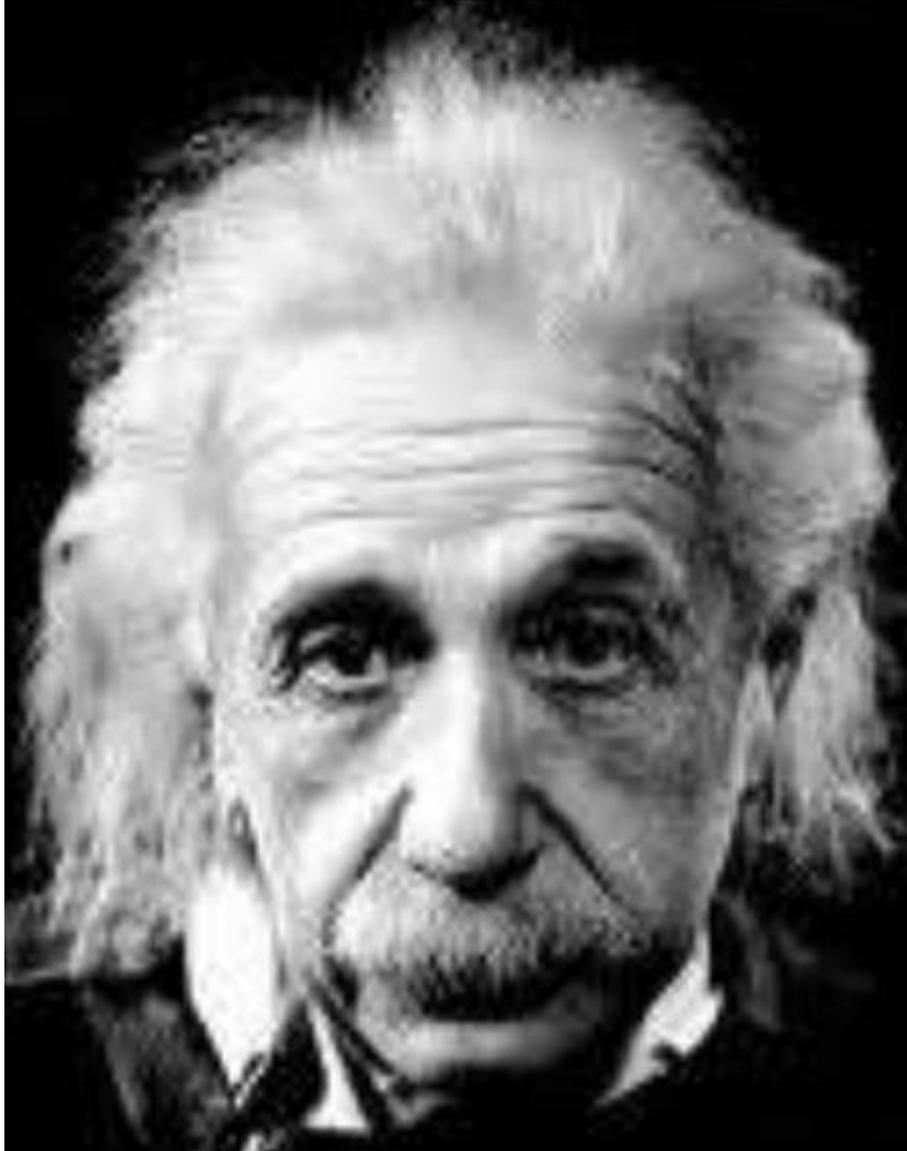


Will anyone like to leave the world with out paying back his credits?

# Introspection

- Where are we?
- Never too late.
- It is today & now.
- Finality of innovation?

# Geniuses are Made... *Not Born*



Didn't Speak Until 4

Didn't Write Until 7

Was Declared Slow and  
Mentally Handicapped

# PhD at 82 yrs



**૮૨ વર્ષની વયે પીએચડી**  
**જૈન શ્રાવકે આચાર્ય ધર્મસૂરીશ્વરજી**  
**મ.સા. પર લખ્યો મહાનિબંધ**

મુમુક્ષુ માર્ગે આજ કયા પદે  
પર પુસ્તક મુખીની પ્રત્યેક જવાબદારી  
સાધન પુસ્તક નિભાવી છે. હાલ તેમના  
સંપત્તિ અને સંપત્તિને વ્યતિત કરવા  
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મ.સા.ના  
અભિપ્રાય અને  
સાસનને સમર્પિત  
આવશ્યકતા  
અને જીવન  
શિખરભાઈએ

એવું પણ જણાવ્યું છે કે તેમના પિતાની વહેલી  
શિક્ષણના કારણે તેમની પાસે કમલ માટે  
આવશ્યકતા સર્જાઈ હતી તેમનું સંપત્તિ કરૂં,  
જે આજ કયા પદે વલણ મળી રહ્યું.  
આવશ્યકતાને પાલનમાં નિભાવવા  
કરવું અને વિષયોનો વિષયો પર પણ  
કરવું. મુમુક્ષુ માર્ગે આજ કયા પદે

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સક્ત છે.

**ગૃહ પ્રધ**  
**સુરક્ષ**

વેપારીઓની સુરક્ષાની માગ  
લઈને સમગ્ર ગૃહ પ્રધાન આર.  
પરિષદ સમક્ષ રજૂઆત કરવામાં  
આ.જ.પ.ના મલબાર સિ  
વિધાનસભા મંત્રી પ્રજાભાઈ શેઠાણ  
અધ્યક્ષિ હસ્તિ મુમુક્ષુ માર્ગે

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- IAP Neocon 2016
- Audience
- Colleagues, Fellows, Residents & Nurses
- Neonates & Patients

Wish you happy innovating

Thanks