Innovations in Neonatology for affordable care

Surg Rear Admiral Girish Gupta NM, VSM (Retd)
DCH, DipNB, DM, FNNF
Prof & Head, Dept of Pediatrics
SGRR Medical College,
Dehradun
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
- Relevancy
- Tailor-made
- Cost effective
- Exciting / Addictive
Respiratory Care
**Problem:** Skin abrasions/ Sepsis

**Research Question (RQ):**
Safe, atraumatic, effective fixation of ET tube?

Yr-1995
**Problem:**

Cold $O_2$ unfriendly to lungs

**RQ:**

If Warmidified $O_2$ during Ventilation, then why not during routine $O_2$ 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 Warmidified 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 µg/kg/mt (~ 2.5)
  - Added in 8 hrs infusate volume
    - 2.1 µg/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
Asepsis
Alcohol Dispenser for Hand disinfection

Background:
Higher incidence of infection

RQ:
How to reinforce hand disinfection in economic & feasible manner?

Year 1995
Background:
Higher incidence of infection

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

Year 1995
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
Isabgol 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 10th: 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 is inserted through the stem of the cannula
Intra-osseous Trainer

- Mutton leg
Umbilical Vessels Catheterization trainer

Surg Capt Ashok Yadav
Umbilical Vessels Catheterization trainer
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 without 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
Acknowledgments

- IAP Neocon 2016
- Audience
- Colleagues, Fellows, Residents & Nurses
- Neonates & Patients
Wish you happy innovating

Thanks