Bubble CPAP Introduction
Outline

- Introduction
- Causes of Respiratory Distress
- CPAP concept
- Pumani CPAP machine
- Results from QECH evaluation of Pumani CPAP
- Roll out implementation plan
Introduction

• What are the main causes of neonatal respiratory distress at your hospital?

• How are we managing them?

• How effective is the treatment?

• What other options could be helpful?
COMMON CAUSES OF NEONATAL & INFANT RESPIRATORY DISTRESS

1- RDS: respiratory distress syndrome
2- pneumonia
3- TTN: transient tachypnea of the newborn
4- MAS: meconium aspiration syndrome
5- PPHN: persistent pulmonary hypertension of the newborn
6- apnea of prematurity
7- bronchiolitis
8- upper airway obstruction
Respiratory Distress Syndrome

- RDS occurs primarily in premature infants; its incidence is inversely related to gestational age and birthweight.
- It occurs in 60–80% of infants less than 28 wks, 15–30% of those between 32 and 36 wk, about 5% beyond 37 wk, and rarely at term.
- Surfactant deficiency is the primary cause of RDS.
- Increased risk in maternal diabetes, multiple births, Caesarian Section, precipitous delivery, asphyxia, cold stress, and a history of previously affected infants.
- Reduced risk with antenatal steroid use.
- Management: oxygen, CPAP, ventilation, surfactant, antibiotics, NGT
CPAP

- Continuous Positive Airway Pressure....
Background

- 15 million babies born globally, 10% are premature
- 1.1 million preterm babies die every year
- More than 1 million premature babies die shortly after birth, majority due to RDS or respiratory distress of other aetiology
- With inexpensive treatment 75 percent could survive
Background Malawi

- Population: 15.3 million*
- Districts: 28*
- NMR: 31/1,000*
- IMR: 58/1,000**
- Preterm Birth rate: 18%*
- Oxygen from concentrators
- No neo ventilators, no CPAP
- No walled oxygen

Source: *DHS 2010; ** (2010 stat, WHS 2012)
Trend in ventilation and CPAP rates among neonates, NSW (New South Wales) 2001-2008

Roberts et al. BMC Pediatrics 2011, 11:89
• COST has been the major barrier.....
LOW COST bCPAP FOR MALAWI

Pumani CPAP

- Developed at Rice University & Texas Children’s Hospital
-Evaluated at QECH
What is bCPAP?

- bCPAP stands for bubble continuous positive airway pressure.
- It is a constant pressure applied to the airway, generated by continuous, consistent flow of air with the aim of opening collapsed lung segments and maintaining patency in already opened air spaces.
Why Now?

- Respiratory problems are the most common cause of illness and death in children.
- In our hospitals, there is really nothing on offer for children whose severe respiratory distress fails to respond to oxygen therapy.
- Studies have shown that introducing bCPAP could improve survival in babies with severe respiratory disease by about 70%.
How does bCPAP help?

- On inspiration, bCPAP drives air with additional pressure into collapsed alveoli and opens them. This process is sometimes called ‘recruitment’.
- The pressure is maintained even when the patient breathes out, therefore the alveoli do not collapse at the end of expiration.
- The lung expands easily thus improving oxygenation and reduces the need for increased work of breathing.
Lung Recruitment Video
Indications for CPAP

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Contra-indications for CPAP

- Severe Birth Asphyxia
- Upper airway abnormalities
  - choanal atresia, cleft palate, tracheoesophageal fistula
- Severe cardiovascular instability and impending arrest
- Unstable respiratory drive
- Ventilatory failure
Trial at QECH: Ensure equipment is robust & effective
Survival for Babies with RDS

- Nasal O2: 4/17 (23.5%)
- CPAP: 31/48 (64.6%)

p = 0.006

Survival for Babies with Sepsis

- Nasal O2: 0/7 (0.0%)
- CPAP ALL: 16/26 (61.5%)

p = 0.005
Survival (%) for different birth weights and treatment groups:

- <1.5 kg:
  - Nasal O2: 2/13 (15.4%)
  - CPAP: 19/29 (65.5%)
  - p = 0.000

- >=1.5 kg - <2.5 kg:
  - Nasal O2: 5/7 (71.4%)
  - CPAP: 16/24 (66.7%)

- >=2.5 kg:
  - Nasal O2: 4/5 (80.0%)
  - CPAP: 9/9 (100.0%)
Table S1: Fraction of eligible participants in each treatment group who experienced minor complications during treatment.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Nasal Oxygen</th>
<th>bCPAP</th>
<th>Transitioned from nasal oxygen to bCPAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild facial irritation, &lt;1 day duration</td>
<td>3 (12%)</td>
<td>1 (1.9%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Mild nasal irritation, &lt;3 day duration</td>
<td>1 (4.0%)</td>
<td>7 (13.2%)</td>
<td>2 (22.2%)</td>
</tr>
<tr>
<td>Mild epistaxis</td>
<td>1 (4.0%)</td>
<td>6 (11.3%)</td>
<td>2 (22.2%)</td>
</tr>
</tbody>
</table>
CPAP Data Collection

- Currently we are collecting data to enable us to assess impact of CPAP roll out.
- After roll out we will collect data to guide us on economic impact and on mortality due to severe respiratory distress in neonates.
THANK YOU