Saving Newborn Lives at Birth through Machine Learning

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Founder, Ubenwa Inc

Ubenwa

Birth asphyxia

- Disability
  - Deafness
  - Cerebral palsy
  - Brain damage
  - Learning disability
  - etc
- Death

Port Harcourt

Nigerian Journal of Paediatrics

Perinatal asphyxia in a specialist hospital in Port Harcourt, Nigeria

BA West, PI Opara

Abstract

Objectives: To find the prevalence, and identify risk factors and outcome in neonates who were admitted into the Braithewaite Memorial Specialist Hospital (BMSH) for perinatal asphyxia.
Method: This was a descriptive cross sectional observational study of neonates with low Apgar scores admitted over a period of ten months into the Special Care Baby Unit of the BMSH. All babies with Apgar scores less
than six at one minute and for whom consent was obtained were recruited consecutively. For outborn babies with no Apgar score recording, a history of poor cry from birth with either poor colour, respiratory distress, floppiness or loss of primitive reflexes were used.
Results: One hundred and fifty seven of 630 babies admitted had perinatal asphyxia giving a prevalence of 29.4%. Mean gestational age of affected babies was 36.84±3.67 weeks, and mean birth weight was 3.0±0.9kg. Sixty two (39.5%) of their mothers had no antenatal care (ANC). Mode of delivery in 98 (62.4%) was caesarian section, of which 80
(81.6%) were emergencies, many of whom had complications before
presentation. One hundred and seven (68.2%) and 38(24.2%) babies,
had Apgar Score of 4-5 and 0-3 in one minute respectively. The commonest risk factors were cephalopelvic disproportion (CPD) in the mothers and abnormal presentation, predominantly breech in the fetus. 31.6% of those with severe perinatal asphyxia died.
Conclusion: Prevalence of perinatal asphyxia is high. Lack of ANC, CPD and breech presentation were contributory factors. There is urgent need for maternal education on need for ANC, early intervention and skilled care of babies at birth.

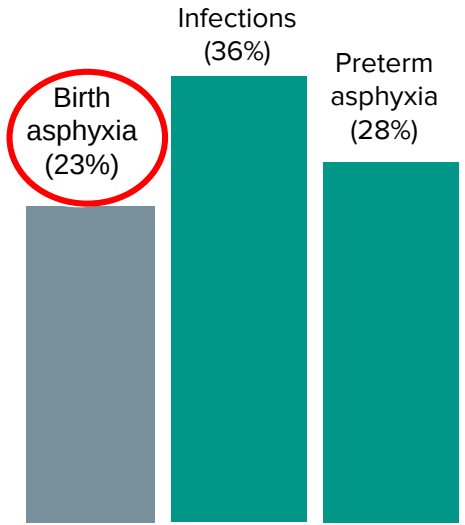
“...prevalence of 29.4%...”

A Global Problem

1 million newborn deaths, annually

1 million lifelong disabilities (brain damage, cerebral palsy, deafness, etc)

One of the top **3** causes of infant mortality



Top 3 causes of newborn mortality by percentage*

World Health Organisation, “Children: Reducing mortality,” Fact Sheet, http://www.who.int/mediacentre/factsheets/fs178/en/, 2016.

Why high Casualty

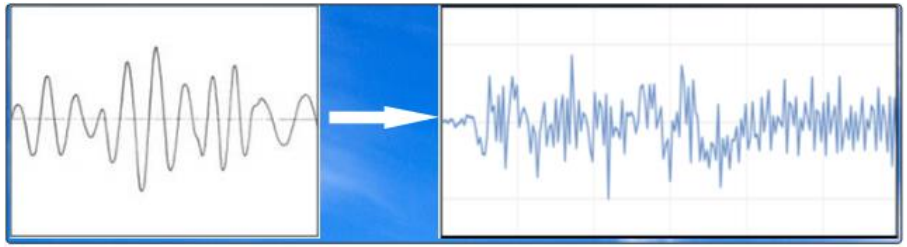
Early detection is hard in low-resource settings due to high cost and skill required.

Nurses and midwives depend on the visual signs such as pale limbs to detect

Unfortunately, at this point the baby could have suffered from damage to the brain

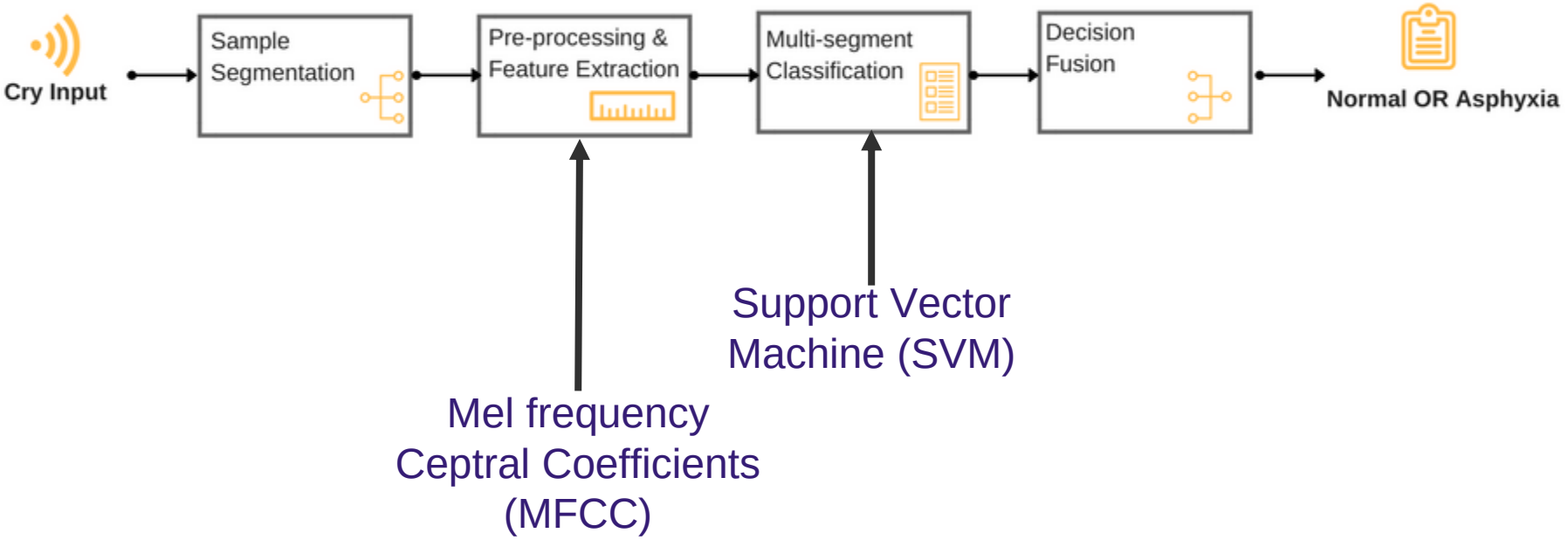
Infant Cry as a Vital

Asphyxia causes alteration in frequency patterns of the baby's cry



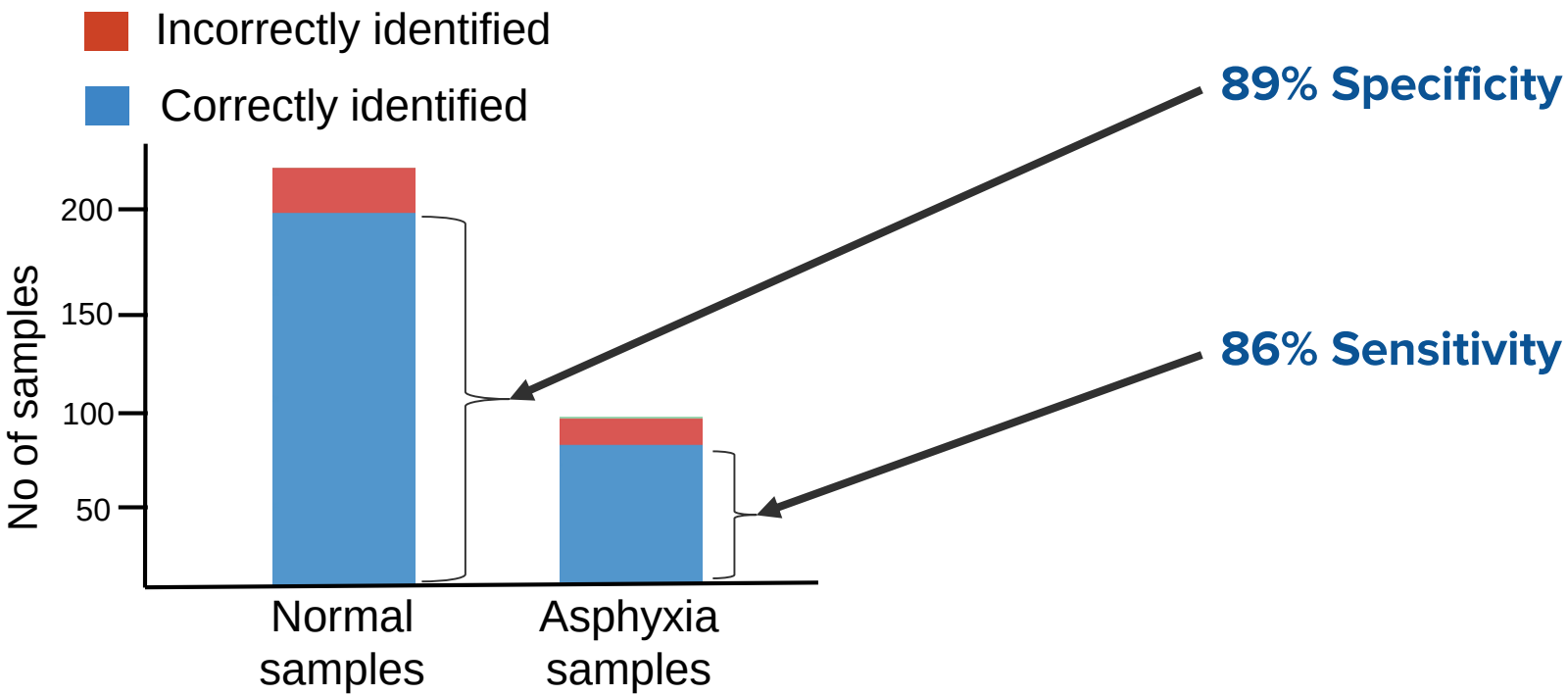
We can use machine learning to study these patterns!

Learning Pipeline



1. Onu C. C. et al, “Ubenwa: Cry-based Diagnosis of Birth Asphyxia”, 2017. https://arxiv.org/abs/1711.06405
2. Onu C. C., “Harnessing infant cry for swift, cost-effective diagnosis of perinatal asphyxia in low-resource settings,” 2014 http://ieeexplore.ieee.org/document/7147559/

Classification Results



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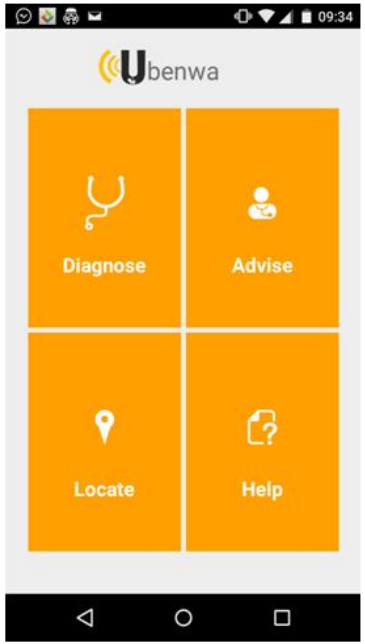
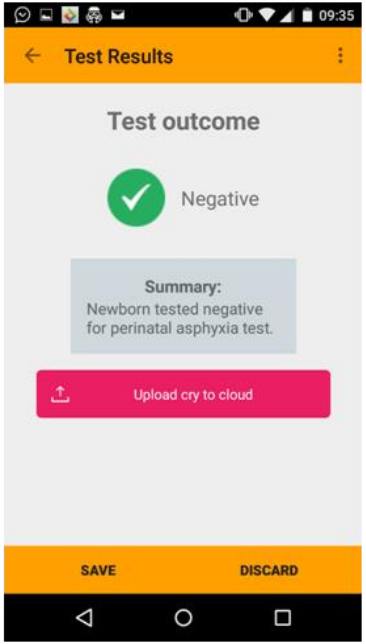
Ubenwa


09:34
Ubenwa
Diagnose
Advise
Locate
Help


09:34
Diagnosis
DETECTOR
HISTORY
Record
File: {no sound}
Real-time
Offline


09:36
Diagnosis
DETECTOR
HISTORY
Please Wait
Diagnosis in progress...
1449844611817.wav
Real-time
Offline


09:35
Test Results
Test outcome
Negative
Summary:
Newborn tested negative for perinatal asphyxia test.
Upload cry to cloud
SAVE
DISCARD

Ubenwa

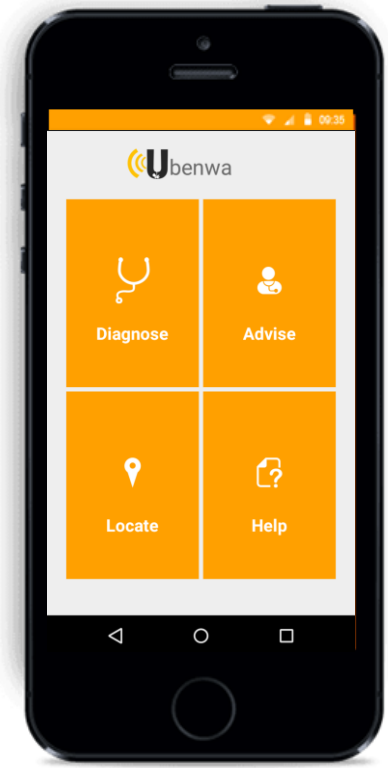
Cry-based diagnosis of birth asphyxia

10 seconds to diagnosis

Non-invasive and no expertise required

95% cheaper than alternative

N0 expertise needed



Data Acquisition and Validation

Goal: Collect up to 10k clinically-annotated infant cries

Centre universitaire de santé McGill — McGill University Health Centre — Canada

UPTH
UNIVERSITY OF PORT HARCOURT TEACHING HOSPITAL — Nigeria

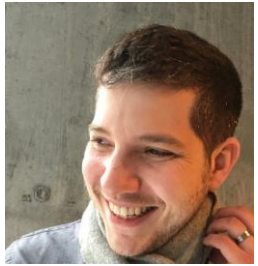
Team

Charles C Onu

- **Founder / AI Lead**
- PhD student in Machine Learning, McGill University
- 6 years software/machine learning engineering experience

Peace I Opara

- **Clinical Development Lead**
- Neonatologist, University of Port Harcourt Teaching Hospital, Nigeria
- Member, Neonatal Resuscitation committee, paediatrics association of Nigeria



Jon Lebensold

- **Strategy Lead**
- Co-founded Paradem Consulting

Innocent C Udeogu

- **Software Engineering Lead**
- Software and entrepreneurship, Meltwater Entrepreneurial School of Technology (MEST)
- Co-founder, Fisher Foundation

Advisory board

Doina Precup

- **Professor of computer science, McGill University**
- Research Director, Google DeepMind, Montreal

Robert E Kearney

- **Professor of Biomedical Eng, McGill University**

Edward Alikor

- **Professor of paediatric neurology, University of Port Harcourt Teaching Hospital, Nigeria**
- President-elect, Paediatric association of Nigeria

Urbain Kengni

- **Strategy Consultant, Workday**

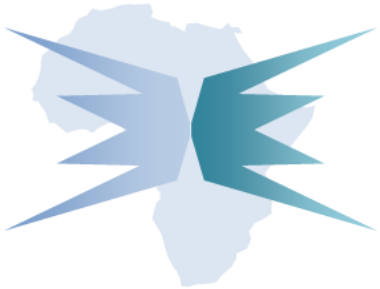
Eyenimi Ndiomu

- **MD, MPH**
- Family medicine resident

Gautam

- **PhD candidate, Speech processing and Machine Learning, McGill University**

Acknowledgement



Thank you

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