Understanding the Drivers of Child Mortality during and after Illness in Africa and Asia

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Photo credit: Uganda MCSP
Speakers

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What is the problem?

Many children with acute illness in LMICs remain at high risk of death...
... despite global reductions in child mortality

Anthropometry/clinical features predictive but don’t indicate mechanisms and treatment

Emerging recognition of post-discharge mortality
The CHAIN Network

- **Pathways leading to death**
  - Clinical/nutrition/demographic
  - Social science
  - Systems biology

- Despite using guidelines
  ...as far as possible

- Actionable interventions
CHAIN Cohort

Acutely-ill children aged 2-23 months → 3 strata by anthropometry

- NW
- MW
- SWK

Flowchart:
- Admission
- Daily observation
- Discharge:
  - Disch. + 45
  - Disch. + 90
  - Disch. + 180
- Home visit
- Death → Verbal autopsy
3,101 children enrolled at admission to hospital
median age 11 (IQR 6-16) months

NW: 1120
MW: 1218
SWK: 763

Conditions:
- Pneumonia
- Diarrhoea
- Sepsis
- Malaria
- HIV inf/exp
Overall mortality

- 249 (20%)
- 62 (8.1%)
- 39 (3.5%)
- Lost to follow up: 116 (3.7%)
Inpatient & post-discharge mortality

- Post-discharge (48%)
- Index admission (52%)

No heterogeneity between strata P=0.85

- NW: 44% (Post-discharge: 22%, Index admission: 22%)
- MW: 48% (Post-discharge: 24%, Index admission: 24%)
- SWK: 49% (Post-discharge: 25%, Index admission: 24%)
SEM: 30-day mortality

Bootstrapped AUC: 0.81 (0.78 - 0.84)
30-day mortality scores by anthropometric strata

NW  MW  SWK

0%  1%  4%  20%  65%

30-day mortality risk
SEM: 180-day post-discharge mortality

site as a random effect

Bootstrapped AUROC: 0.81 (0.77 - 0.84)
Clinician Likert Scale at discharge

AUROC: 0.56 (95%CI 0.52-0.62)

Post-discharge mortality risk:
- Almost certainly not: 0%
- Very unlikely: 3%
- Quite unlikely: 15%
- Unsure: 50%
- Quite likely: 15%
- Very likely: 3%
- Almost certainly: 0%

AUROC: 0.56 (95%CI 0.52-0.62)
Costs to families - Kenya/Uganda

Direct costs during hospitalization for all participants (n=731)

- Travel
- Administration
- Food
- Bed charges
- Drugs
- Tests
- Diapers
- Other costs

USD (square root scale)

Thresholds values for catastrophic health expenditure

Proportion of households

Catastrophic Health Expenditure Thresholds as % of Household Income

SWK  Non-SWK
Antimicrobial resistance - Kenya sites
Implications for care

• Anthropometry a crude risk marker capturing various domains

• Maternal & social risks important

• Clinician ‘Gestalt’ performs poorly

• Many low risk - early recognition & discharge

• Substantial post-discharge mortality

• Child centred care
• Respect
• Communication
• Resource allocation
• Continuity of care
CHAIN NETWORK
The Childhood Acute Illness & Nutrition Network
The CHAIN Network aims to optimize care for vulnerable children in low-resource settings to improve survival, growth and development.

www.chainnetwork.org
Additional slides
Types of life-threatening events post-discharge

- Separate episode
  (usually same risk factors)
- Inadequate treatment
- Healthcare acquired, community presentation
Household

Mother/carer(s)

Infant

Birth

Age 1 year
Optimizing Post-Discharge Care in Acutely Ill Children in Uganda

The Childhood Acute Illness & Nutrition (CHAIN) Network

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Background

- Uganda population over 42 million
  - Children <5 years contribute 18% - over 8 million

- Burden of malnutrition
  - Stunting 2.5 million children
  - Over 8 million children develop child wasting

- Mortality per 1000 livebirths
  - Neonatal stagnated at 27 for over 20 years
  - Under-five 64
Makerere University Site – Mulago National Referral Hospital

• Mulago National Referral Hospital site:
  ➢ 1500 General In-Patients/Day
  ➢ 39,000 OPD Children/ Yr = 160/Day
  ➢ Inpatient load children – 300 hospitalized/day
  ➢ ~3% die
  ➢ Neonatal mortality – 20%

  ➢ <5 common causes of Death

  Causes of Death
  • Pneumonia 23%
  • Diarrhoea 14%
  • Malaria 13%
  • Malnutrition 13%
  • Measles 12%
  • Meningitis 6%
  • Anaemia 4%
  • TB 4%

• No study on post-discharge mortality prior to CHAIN
Challenges and Opportunities

- Patient volumes vs staffing levels to cover day, evening and night shifts

- Characteristics of a large National referral Teaching hospital:
  - Recurrent enrolment of new resident/postgraduate and intern doctors, nurses and undergraduates
  - Need for robust system to train and retrain
  - Possession of handheld smartphones
  - Fragmented facility healthcare services – general, specialized wards, and assessment center
  - Patient congestion/overcrowding

Trainees – People

- >170/day in OPD assessment
Admission and Discharge Process

• Screening at assessment center – outpatient and inpatients during day
  ➢ Late afternoon, evening and night screening, triage at Acute Care Unit (ACU)

• ACU is a 24-hour withholding emergency ward – resuscitation and 24-hour initial treatment
  ➢ Stable children are discharged following day
  ➢ Sicker patients are admitted to general and specialized wards for continued inpatient care

• Children with specialized chronic conditions such as SCA, cardiovascular, asthma, etc are discharged to attend with appointments to >10 specialized ambulatory clinics
  ➢ Minimal guidance on-discharge for children recovering from common acute illnesses
  ➢ Some advised to return – assessment center, ACU, or general ward by individual clinician
CHAIN Implementation

Social Experiences

- Children experiencing or living under multiple social disruptions
- Households with social disruptions prominent for children with severe wasting
- Parents leaving farther apart or separated
- Mothers or parents with limited skill in parenting
- Single young mothers
- Broken young families and children - grandmas or other extended family members
- A number of mothers replacing childcare for income generating activities
  - Children are left with nannies who have limited skill or passion in child care throughout the day
- Limited father engagement in child care
- Changing residents rural vs urban in an effort to survive
- Abscondment from inpatient care – runaways
CHAIN Implementation

Lessons Learnt

• Recognition of post-discharge mortality burden – 1st study
• Need to formalize guidelines for observation ward and standardize risk stratification
• Need for quality improvement teams and systems to improve quality of care
• Recognized existing gap in follow-up care to avert post-discharge mortality
Implications and Target Opportunities for care

- Admission evaluation
- Draft guideline, implementation
- Low risk → Early review → Early discharge
- Draft guideline, implementation
- Safety: death, readmission
- Costs, staff time
- High risk → Enhanced inpatient care → Discharge evaluation
- Draft guideline, implementation
- Efficacy: death, readmission
- Virtual ward
- Phone/SMS
- Facilitate ER access
- Danger signs Training
- Psychosocial Financial

- Implications and Target Opportunities for care
Health Facility and Community Level Opportunities

• Develop and standardize:
  ➢ Criteria for risk stratification for frontline health care providers
  ➢ Guidelines for discharge and enhanced inpatient care

• Target opportunities of follow-up care using:
  ➢ Counseling and training caregivers at discharge on child illness and process of recovery, danger signs, key family care practices (KFCPs) for prevention, Family Caregiver MUAC use
  ➢ SMS messaging,
  ➢ Outreach sites for immunization programs as healthcare workers can be accessed to review,
  ➢ Community health workers (CHWs),
  ➢ Nearby health facility for review

• Targeted peer social and income security support for caregivers discharged having children with severe wasting
  ➢ Community interventions and linkages – Optimize community family care groups
Health Facility and Community Level Opportunities

• Digitalize into mobile application to enable implementation, transition and scale-up processes:
  - Risk stratification,
  - Discharge guidelines
  - Counseling and training for caregivers and
  - Monitoring or tracking beneficiaries

• Develop simplified job aids for caregivers/mothers and integrated CHW job aid, user manual (Post-dis, iCCM, KFCPs, Family MUAC)
  - Integration reduces parallel programming

• Conduct implementation research to guide:
  - Uptake, Acceptability, Self-efficacy
  - Adaptations and
  - Sustainability
THANK YOU

Q & A