Surveillance and Response to Prevent Malaria Re-emergence

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Agenda

- Discuss thoughts about malaria reemergence (thoughts, due to limited information on the topic)
- Discuss interventions to prevent and/or respond to such events
- Keep recommendations focused on what feasible, or advisable, in the context of the Americas

Terms of Interest

- **Malaria importation**
  - **A person acquires malaria in an endemic area and goes to a non-endemic area**
- **Malaria introduction**
  - **First-generation transmission of malaria originating from an imported case in a malaria-free area**
- **Indigenous malaria**
  - **Local malaria transmission without any direct link to an imported case**

Terms of Interest

- **Malaria outbreak**
  - **Increase in number of expected cases in a given area during a period of time**
  - **Either increase from baseline transmission or reintroduction**
- **Malaria reemergence vs. reestablishment vs. reintroduction**
  - **In most cases, referring to the same thing (though not always)**

Malaria Reemergence

- Receptivity
  - Presence of vectors, and ecological/climatic conditions favorable to malaria transmission
  - How capable area is to allow for transmission
- Vulnerability
  - Proximity to malarious areas or possibility of influx of malaria patients or vectors
  - Possibility of malaria parasite introduction

Preparedness

- Risk assessment and monitoring
- Programmatic and systemic readiness for response
- Malaria surveillance
  - Detection of initial cases
- Ability to respond

Risk Assessment and Monitoring

- Malariogenic potential
- Factors influencing vulnerability and receptivity
  - Migration patterns, climate, rainfall
- Malaria early warning systems
  - Different ways to set up such a system

Systemic Readiness

- Maintenance of malaria expertise for malaria control and prevention
- Difficult in countries that reached malaria elimination
  - Tendency to lose expertise once malaria no longer a concern
- Expertise and commodities ready to deployment

Systemic Readiness

- Malaria preparedness plan
  - Information on roles and responsibilities during an outbreak or reemergence episode
  - Guidance on leadership, involvement of other public health programs, communication chain, resources mobilization
  - Description of relationships and reliance on external partners
  - Operating procedures for intervention implementation of control interventions

Systemic Readiness

- Response team
  - At minimum: an epidemiologist, a laboratorian and an entomologist
  - Desirable: logistician, communication specialist, etc
- Supply chain
  - Availability of drugs and diagnostic supplies

Malaria Surveillance

- Detection and reporting of cases (during outbreak and not!!)
- Basis for appropriate treatment
- Reliance on laboratory proficiency
  - Need to be maintained

Entomological Monitoring

- Ground work done as part of preparedness process
- Areas with malaria receptivity and/or vulnerability
  - Yearly monitoring of vector composition and insecticide resistance even if no transmission
  - Support decisions on control measures

Outbreak Definition

- Increase in number of expected cases in a region during a period of time
- In malaria-free areas
  - One, just one!!, introduced or indigenous malaria case is an outbreak

Response Mode

- Dynamic, activities and their intensity changing over the course of a response
- Beginning
  - Case detection
    - Timely laboratory confirmation by expert microscopy or molecular methods of all cases
    - In-depth interviews to asses place of infection and collect demographic info (imported vs. introduction and indigenous)

First Steps in Response

- Inventory of local, regional and national capacity to respond
- Mobilization of proficient staff for laboratory diagnosis and case management
- Availability of supplies
- Definition on communication channels and leadership roles

Laboratory Methods

- Microscopy
  - Gold standard method
  - Dependence on microscopists expertise
- Rapid diagnostic tests (RDTs)
  - Less sensitive
  - No quantification
- Molecular-based tests
  - Little role in outbreak detection
  - Complementary (later) important role

Laboratory Preparedness

- Maintenance of microscopy expertise at either local or regional/central level
  - Continuous training needed
- Availability of reagents and equipment
  - Appropriate supply chain (Edgar's expertise!!)
- Plans for scaling up microscopy capacity if needed
- Timely result reporting systems

Laboratory Preparedness

- RDTs as alternative for timely case management (treatment decisions)
- Quality assurance and control systems in place and running
- Mandatory collection of smear for confirmation (all positive cases, all or a sample of negative cases)
- Consider collection of samples in filter paper for future molecular testing

Treatment Preparedness

- Availability of good quality drugs (Edgar's expertise again)
- Appropriate regimens for implicated species and strain
  - Issue of chloroquine-sensitive parasites
  - If in doubt, cover chloroquine-resistant parasites
- Training of healthcare workers in identifying, testing and treating cases

Initial Cases Follow-up

- Close clinical and parasitological monitoring to ensure treatment compliance and parasite clearance
  - Difficult as transmission progresses
- Adopt broader case definition (less specific) of suspected malaria case, eg fever
- Reinforce passive case detection and reporting in neighboring areas

Case Finding

- Active case detection
  - Public health officials identifying and reporting cases
  - Time consuming on response team
- Passive case detection
  - Healthcare workers or laboratorians identifying and reporting cases
  - Risk of missing cases
- Generally a combination of the above

Contact Investigation

- Evaluation of home and work contacts of confirmed cases
  - Determination of radius for contact investigation (most cases, household contacts and immediate neighbors)
  - Testing of all contacts or only symptomatic contacts
    - Epidemiological decision
    - Most infected people symptomatic in non-endemic areas

Contact Investigation

- Evolving contact investigation strategy during re-emergence episodes
  1. Only symptomatic contacts
  2. All contacts irrespective to symptoms
  3. Population-based surveys
- Epidemiological decisions
  - More is not always better

Surveillance

- Plot cases in time and space
- Geographic mapping by place of residence or probable place of infection
- Periodical analysis of data and decisions on what follow up/control measures
- Decisions based on data, not assumptions if possible

Control Measures

- Proper case management
  - Identification of cases
  - Accurate diagnosis
  - Proper treatment
- Vector control
  - Indoor residual spraying
  - Insecticide-treated nets (ITNs)
  - Larviciding in special cases
    - Limited and localized breeding sites

Questionable Interventions

- Fogging
  - Limited value, temporary effect
- Mass drug administration
  - Risk of drug overuse and side effects
  - Cost effective when malaria prevalence >55–70%

Follow-up Studies

- Case-control studies
  - Determine causes and mechanisms of transmission
  - Often later in an outbreak response
  - Not a reason to delay implementation of control interventions
- Molecular analysis
  - Genotyping
  - Later in outbreak for evaluation of dissemination patterns

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Laboratory Network

- Availability of quality microscopy, if possible
- RDTs as ‘first-line’ diagnostic tool but smears taken for confirmatory
- Samples in filter paper for subsequent testing
  - Confirmatory assays
  - Genotyping and resistance testing