NATFORLAB 2026

POCT as a Bridge Between Laboratory Diagnostics and Clinical Decision-Making

Clinical Experience with MxA/CRP Biomarkers

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The Clinical Challenge

Managing Pediatric Respiratory Tract Infections

The Burden of Pediatric RTIs

Lower Respiratory Tract Infections (LRTIs) remain a primary driver of global pediatric morbidity, mortality, and emergency medical utilization.

- **Overlapping Presentations:** Fever, tachypnea, and chest retractions obscure the underlying etiology (viral vs. bacterial).
- **Time-Sensitive Triage:** Frontline clinicians must make immediate admission and treatment decisions without definitive laboratory support.

Diagnostic Uncertainty

Traditional diagnostic tools often fail at the point of care, creating a cycle of defensive medicine.

Turnaround Time

Standard cultures take 48-72 hours.
Highly accurate multiplex PCR panels are often unavailable during the "golden hour" of ED triage.

Defensive Prescribing

Clinical ambiguity forces to overprescribe broad-spectrum antibiotics to purely viral patients out of justified caution.

AMR Escalation

This empirical guesswork undermines global antimicrobial stewardship and drives systemic antibiotic resistance.

Scientific Basis of Biomarkers

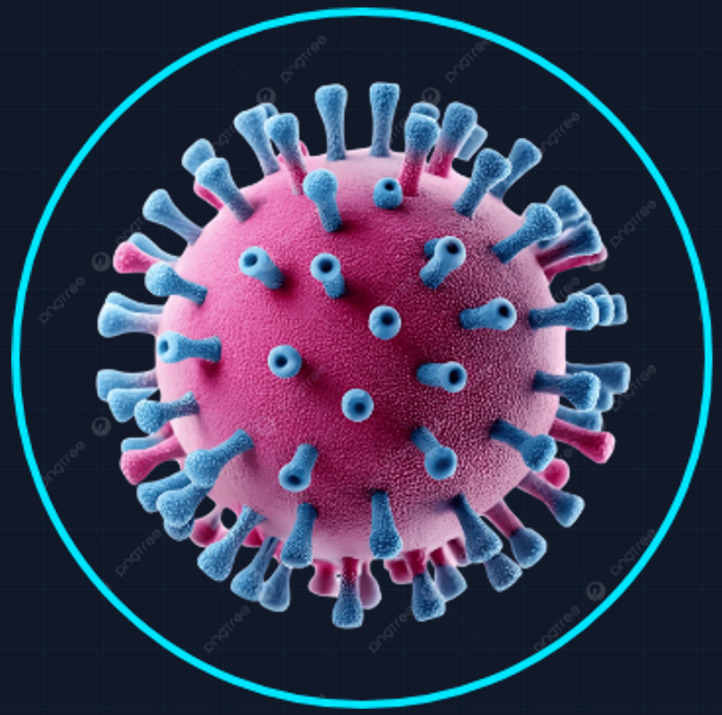
Moving beyond generic inflammatory markers

MxA: Viral Specificity

Myxovirus Resistance Protein A

An intracellular protein exclusively induced by Type I Interferons during active viral replication.

- **Highly Specific:** Entirely unaffected by bacterial cell wall components or general tissue trauma.
- **Stable Kinetics:** Long half-life, remains elevated throughout the acute viral phase.



CRP: Bacterial Sensitivity

C-Reactive Protein

Acute-phase reactant synthesized in the liver, primarily response to IL-6 macrophage signaling.

- **Rapid Escalation:** Surges profoundly in the presence of invasive extracellular bacteria.
- **The Limitation:** Minor elevations (5-15 mg/L) frequently occur in purely viral states, leading to false-positive bacterial diagnoses if not paired with another marker.

The AFIAS Platform & POCT Concept

POCT decentralizes laboratory science, shifting paradigm from "test and wait" to "test and treat" within a single clinical encounter.

AFIAS MxA/CRP Capabilities

- **Micro-volume:** Requires only 10µL of whole blood (ideal for pediatric capillary fingerpricks).
- **Automated:** Immuno-Fluorescence quantitative assay.
- **Rapid Results:** Precise digital readouts in just 12 minutes.

Clinical Integration: POCT Impact

Primary Care (GP Clinics)

Lack immediate diagnostic confirmation during brief (15-min) consults.

- Low training barrier for clinical staff.
- Converts clinical ambiguity into data within a single visit.
- Confidently reassure parents without prescribing "just-in-case" antibiotics.

Emergency Departments

Overcrowded EDs require fast triage and risk stratification of pediatric volumes.

- Enables immediate "Fast-Track" routing (66%) for pure viral cases.
- Preserves isolation beds and advanced diagnostics (34%) for true bacterial threats.

Study Methodology

Evaluating diagnostic efficacy in hospitalized children

Study Design & Criteria

Trial Framework

- Prospective, observational diagnostic validation trial.
- Conducted over 22 months (June 2024 – April 2026).
- Settings: General Pediatrics, PHDU, and PICU at Hospital Tunku Ampuan Besar Tunku Aishah Rohani, UKM

Inclusion Criteria

- Pediatric patients aged 1 month to 12 years.
- Clinical presentation of acute LRTI requiring admission.
- AFIAS MxA/CRP testing conducted within 24h.

Establishing Ground Truth

True etiologydefined using a triangulated, multi-layered reference standard:

- Multiplex Nasopharyngeal Swab (NPS) PCR Panels.
- Standard Automated Blood Cultures.
- Deep Respiratory Aspirate/Sputum Cultures.

Categorized into four distinct diagnostic groups: Pure Viral, Pure Bacterial, Co-infection, or No Infection.

Statistical Power Validation

301

Evaluable Patients

The study was designed to achieve regulatory-grade statistical stability, significantly overpowering the required viral validation arm.

$$n = \frac{Z^2 \times Sens \times (1 - Sens)}{d^2 \times Prev}$$

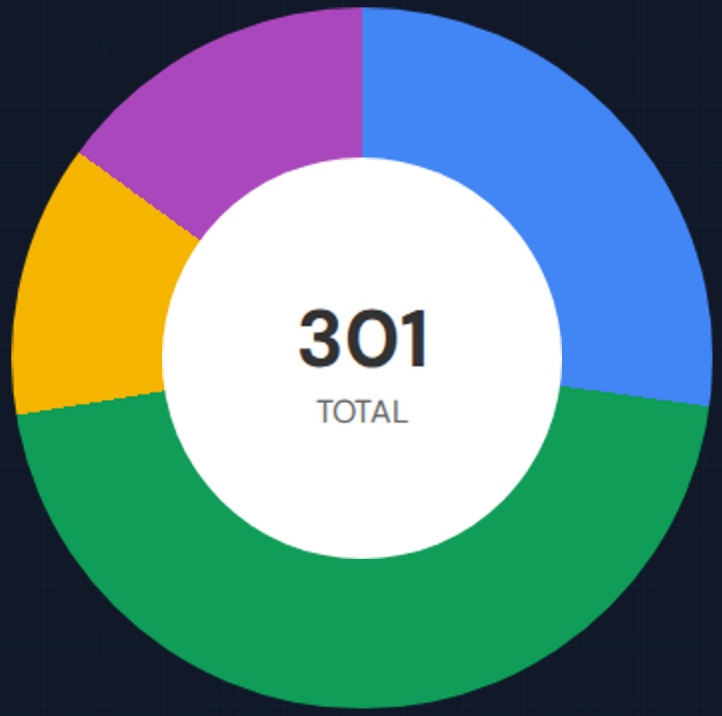
Capturing 289 total viral involvements overpowered the arm by 77.3%, compressing the margin of error to an exceptionally tight 4.55%.

Patient Demographics: Age Distribution

Critical Early Age Focus

Majority of the study population (72.4%) consists of children under 2 years old, highlighting primary demographic for LRTI observation.

- **Infants (<1 year):** 27.2%
- **Dominant Group (1–2 years):** 45.2%
- **Older Cohorts (>3 years):** 27.6%



Diagnostic Distribution (Ground Truth)

Final diagnostic distribution of the 301 patients based on clinical and biochemical interpretation.

Etiology Category	Frequency (n)	Percentage (%)
Pure Viral Infection	191	63.5%
Co-infection (Viral + Bacterial)	97	32.2%
Pure Bacterial Infection	9	3.0%
No Infection	4	1.3%

*Total viral involvement (Pure Viral + Co-infection) = 288 cases.

Diagnostic Efficacy Results

Data-driven triage thresholds via ROC Analysis

MxA Standalone Efficacy

Evaluating MxA thresholds for diagnosing ANY viral presence **(Overall Target AUC: 0.851).**

MxA Cut-off	Sensitivity	Specificity	PPV	NPV	AUC
≥ 50 ng/mL	**93.1%**	**75.0%**	**98.9%**	**31.0%**	**0.840**
≥ 75 ng/mL	87.2%	83.3%	99.2%	21.3%	0.853
≥ 100 ng/mL	80.6%	83.3%	99.1%	15.2%	0.820
≥ 150 ng/mL	71.6%	91.7%	99.5%	11.8%	0.816

Clinical Strategy: While 75 ng/mL yields peak specificity, a **≥ 50 ng/mL** threshold establishes an essential clinical safety net (93.1% sensitivity) to ensure mild or early viral involvements are captured.

CRP Standalone Efficacy

Evaluating CRP thresholds for diagnosing ANY bacterial presence **(Overall Target AUC: 0.854).**

CRP Cut-off	Sensitivity	Specificity	PPV	NPV	AUC
≥ 15 mg/L	88.7%	78.4%	66.2%	93.6%	0.835
≥ 17 mg/L	87.6%	82.8%	70.8%	93.4%	0.852
≥ 20 mg/L	**83.5%**	**89.2%**	**78.6%**	**91.9%**	**0.864**
≥ 25 mg/L	76.3%	93.6%	85.1%	89.3%	0.850
≥ 30 mg/L	66.0%	94.1%	84.2%	85.3%	0.800

Clinical Strategy: A **≥ 20 mg/L** cut-off provides an optimal barrier against false-positive bacterial diagnoses common in minor viral inflammatory states.

Combined Screening Matrix Concept

By executing a dual-biomarker strategy, we map patients into distinct actionable clinical quadrants.

Viral	Bacterial	Co-infection	No Infection
MxA ≥ 50 ng/mL CRP < 20 mg/L	MxA < 50 ng/mL CRP ≥ 20 mg/L	MxA ≥ 50 ng/mL CRP ≥ 20 mg/L	MxA < 50 ng/mL CRP < 20 mg/L

Optimal Matrix Performance Data

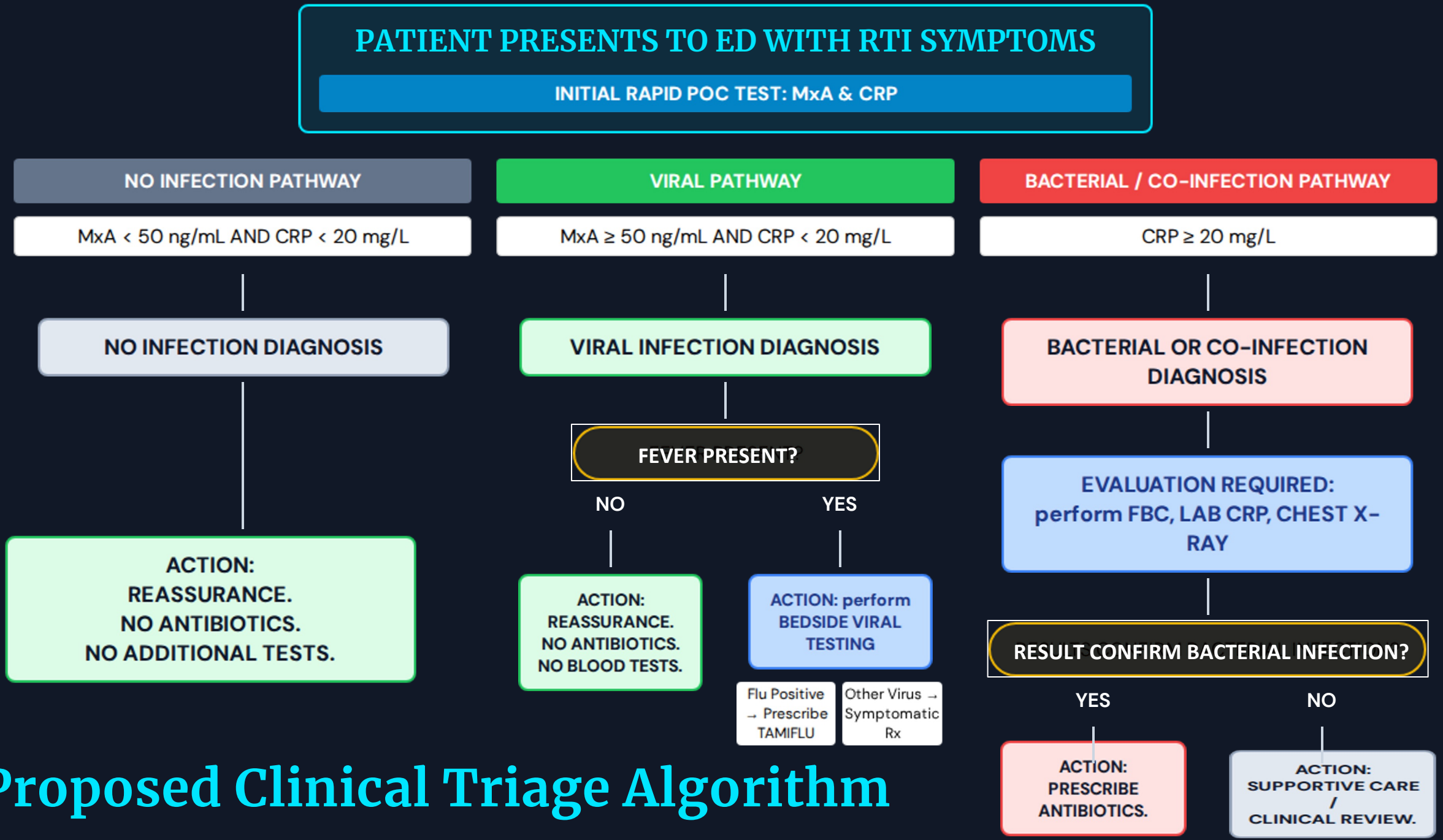
Actual performance of the proposed triage algorithm using cut-offs: **MxA ≥ 50 ng/mL & CRP ≥ 20 mg/L**.

Diagnostic Quadrant	Sensitivity	Specificity	PPV	NPV
Pure Viral	80.9%	82.4%	89.9%	68.9%
Pure Bacterial	**85.7%**	**98.6%**	60.0%	**99.7%**
Co-infection	80.0%	90.0%	77.4%	91.3%
No Infection	40.0%	94.3%	10.5%	98.9%

**This combination prioritizes high sensitivity for viral detection, while maintaining an exceptional 98.6% Specificity and 99.7% NPV for ruling out pure bacterial infections.*

Clinical Application

Implementing the Algorithm in Practice



Proposed Clinical Triage Algorithm

Conclusion: Resource Optimization

90%

Reduction in Overprescription

65.8%

Spared from Invasive Tests

Bridging the Gap

Applying algorithm retrospectively to our data proved that 9 out of 10 unnecessary antibiotic prescriptions in pure viral/non-infective cases would have been successfully blocked at triage.

Furthermore, 198 out of 301 children could have safely bypassed painful venipunctures (FBC) and ionizing chest radiography.

Thank you for your attention.

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