

An integrated paediatric component for the management of Bundibugyo virus disease: a proposed Patient–Provider–Environment model

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Abstract

Background. The Bundibugyo virus disease (BVD) outbreak declared in the Democratic Republic of the Congo (DRC) in May 2026 is the largest ever documented for this virus. As of 30 July 2026, children accounted for nearly one in four confirmed cases but almost one in three deaths, and children under five had a case fatality rate more than twice that of adults. No vaccine or specific treatment is licensed: survival depends on optimised supportive care.

Problem. In children, BVD can progress rapidly from a non-specific febrile illness to multi-organ decompensation. Yet supportive care guidance is largely designed for adults and assumes resources that many response facilities lack.

Proposal. We propose an integrated paediatric component built on two pillars: (1) a systematic Patient–Provider–Environment (PPE) assessment, which considers together the child’s condition, the actual capacity of the caregiver and the material conditions of care; and (2) an individualised pharmaco-clinical approach, in which the choice, dose, route and frequency of each medicine depend on age, weight, severity and complications.

Scope. This model does not replace World Health Organization (WHO) recommendations: it translates them into an operational, reproducible and measurable paediatric framework. We propose quality indicators and an evaluation framework to test its impact on mortality.

Introduction

Bundibugyo virus (*Orthoebolavirus bundibugyoense*), identified in Uganda in 2007, is one of four orthoebolaviruses known to cause disease in humans. Before 2026, only two

outbreaks had been documented, with case fatality rates of 32% to 55% among confirmed cases [1–3].

On 15 May 2026, the DRC confirmed a BVD outbreak in Ituri Province, which spread to Uganda through symptomatic travellers [4,5]. WHO declared it a public health emergency of international concern on 17 May 2026 [6]. As of 30 July 2026, WHO reported 3,605 confirmed cases in the DRC, including 743 children, and 1,587 deaths, including 330 children under 18 years [6]. By 2 September 2026, the case fatality rate in the DRC had reached 48% [1].

Children bear a disproportionate burden: nearly one in four confirmed cases, but almost one in three deaths, with a case fatality rate among under-fives more than twice that of adults [6]. This mirrors findings from the 2014–2016 West African epidemic, where younger age was associated with higher mortality [7,8]. It also occurs on already fragile ground: in Ituri, more than half of children under five are chronically malnourished [9].

No vaccine or specific treatment is licensed against Bundibugyo virus (BDBV). Candidate products should be evaluated only within approved clinical trials [5]. In this context, early, structured and optimised supportive care remains the main lever for reducing mortality [10,11]. This article proposes a model to make it operational for children.

The clinical challenge: a child who decompensates fast

BVD often begins with a non-specific febrile illness that is hard to distinguish from malaria, gastroenteritis or common respiratory infections in children. In the 2026 Ugandan series, all patients admitted to the treatment unit were febrile; headache (83%) and myalgia (78%) predominated, followed by vomiting (44%) and diarrhoea (39%). Bleeding was uncommon (17%) [1]. Haemorrhagic signs should therefore not be awaited before suspecting the disease or escalating care.

On admission, all Ugandan patients had hyponatraemia, hypoalbuminaemia and raised transaminases; 16% were hypoglycaemic [1]. In children, these abnormalities have rapid consequences. Gastrointestinal losses lead to dehydration and hypovolaemia, then shock. Limited glycogen stores expose them to hypoglycaemia. Hyponatraemia can cause seizures and altered consciousness.

Three difficulties specific to children complicate the response:

- **Limited physiological reserve**, which shortens the interval between a compensated state and collapse.
- **Difficult vascular access**, made worse by dehydration and by working in personal protective equipment, which delays rehydration.
- **Laboratory tests that are often unavailable** in response facilities, even though fluid and electrolyte management depends on them.

This leads to a central principle: care must rely on **frequent, dynamic clinical reassessment** (peripheral perfusion, capillary refill time, urine output, level of

consciousness, respiratory rate, capillary blood glucose) rather than on laboratory tests that are often missing. Basic laboratory tests, when available, remain useful to guide management [1].

The provider and the environment as prognostic determinants

The quality of paediatric care does not depend only on the child's condition. It also depends on who provides care, and under what conditions.

The provider. Response teams are multidisciplinary, with widely varying experience in paediatric critical care. Prolonged use of personal protective equipment reduces dexterity, the length of time staff can work and communication. Staff rotation weakens continuity of care. WHO stresses that sufficient numbers of trained and equipped staff are a prerequisite for optimised supportive care [10]. Health worker protection should also be tracked as a core indicator of the response [5]: in 2026, the first case clusters in the DRC were identified among health workers [4].

The environment. Oxygen, power, paediatric equipment (small-gauge needles and cannulas, intraosseous devices, appropriately sized cuffs), essential medicines, monitoring, patient flow and the organisation of care stations form a single system. A single gap, such as the lack of a paediatric pulse oximeter or a weighing scale, can make an otherwise correct recommendation impossible to apply.

We therefore propose that these three elements no longer be assessed separately, but together, at every clinical decision.

Proposal: the Patient–Provider–Environment model applied to BVD

The PPE model rests on a simple idea: a clinical decision is safe only if the child needs it, the provider present can carry it out, and the environment allows it. This framework stems from the lead author's work on the PPE-KAMPDs® protocol in paediatric anaesthesia [12]; we extend it here to supportive care for BVD.

At each assessment (on admission, then at an interval set by severity), the team answers three sets of questions:

Dimension	Key questions	If the answer is “no”
Patient	What is the level of severity (perfusion, breathing, consciousness, glucose)? What is the measured or estimated weight? Which symptoms predominate? Is there malnutrition or comorbidity?	Classify the child as high priority and shorten the reassessment interval
Provider	Is the provider present trained for this procedure (intraosseous access, fluid titration)? How much longer can they work	Call the paediatric lead, set up a two-person team, or schedule the procedure

Dimension	Key questions	If the answer is “no”
	in protective equipment? Who takes over at handover?	before handover
Environment	Is weight-appropriate equipment available? Are oxygen and power secured? Can the child be weighed, glucose measured, SpO ₂ monitored?	Activate a pre-planned alternative (oral or intraosseous route, substitute device) and report the shortage

The model’s main contribution is to make visible the care failures that do not come from the disease itself: delayed fluid resuscitation for lack of venous access, undetected hypoglycaemia for lack of a glucometer, monitoring interrupted at the end of a shift. Each of these failures becomes a data point that can be corrected and measured.

An individualised pharmaco-clinical approach

The second pillar concerns prescribing. In an epidemic emergency, it is tempting to apply a uniform “kit” to all patients. In children, this uniformity carries two opposite risks: underdosing, which makes treatment ineffective, and overdosing, to which low-weight children are particularly vulnerable.

We propose that every prescription be determined by five parameters:

1. **Age**, which governs hepatic and renal maturity and the choice of formulation.
2. **Measured weight**, or weight estimated by a standardised method when measurement is impossible, for calculating all doses and fluid volumes.
3. **Severity**, which guides the choice of oral, intravenous or intraosseous route and sets the frequency of reassessment.
4. **Predominant symptoms** (vomiting, diarrhoea, pain, fever, seizures), which target symptomatic treatment.
5. **Observed complications** (shock, hypoglycaemia, electrolyte disorders, renal or hepatic failure), which require certain medicines to be adjusted or avoided.

This approach builds on existing WHO recommendations for supportive care in Ebola disease and for hospital care of children [10,11,13]. It does not create new treatment regimens: it organises their application case by case. The near-universal liver involvement observed in 2026 [1] calls for particular caution with hepatically metabolised drugs.

Candidate drugs against BDBV, including those used on a compassionate basis [1], fall within the scope of clinical trials and national protocols [5]. The proposed paediatric component does not change their indications; it aims to ensure that every treatment, specific or symptomatic, is given at the right dose, by the right route and with the right monitoring.

Operational dosing tables will be developed and validated by a clinical and pharmacy committee before any implementation; they are deliberately not included in this paper.

Implementation and quality indicators

The paediatric component has five elements, to be deployed in one or more pilot treatment centres:

- **Protocols:** a context-adapted paediatric algorithm, derived from WHO recommendations, embedding the PPE grid at every step.
- **Clinical supervision:** a paediatric critical care lead (paediatrician, anaesthesia and critical care provider, or trained nurse) reachable on every shift.
- **Staff training:** short, repeated sessions on paediatric assessment, intraosseous access and clinically guided rehydration, with simulation in protective equipment.
- **Pharmaceutical adaptation:** weight-band dosing tables, suitable formulations and double-checking of calculations.
- **Environmental improvement:** a minimum list of paediatric equipment per care station, checked at the start of each shift.

To make the model measurable, we propose the following indicators, to be validated with field teams:

Domain	Proposed indicator
Process	Proportion of children weighed (or with estimated weight) on admission
Process	Time from admission to first complete PPE assessment
Process	Adherence to the planned reassessment interval by severity
Process	Proportion of children with capillary glucose measured within the first hour
Provider	First-attempt success rate of vascular access (venous or intraosseous)
Environment	Number of equipment or oxygen shortages that delayed care
Outcome	Paediatric case fatality rate in treatment centres, overall and by age group
Outcome	Case fatality within the first 48 hours after admission

These indicators would allow comparison of the periods before and after the introduction of the paediatric component, within an approved ethical framework.

Limitations and outlook

This paper is a conceptual proposal: the model has not yet been implemented or evaluated in BVD. The clinical data cited come mainly from adult or mixed series, and detailed paediatric data on BDBV remain scarce. Extrapolation from experience with Zaire ebolavirus should be cautious, as BDBV is a distinct species, genetically and antigenically.

Feasibility will depend on the actual resources of treatment centres, the availability of a paediatric lead and integration into national protocols. We therefore propose a stepwise evaluation: validation of the PPE grid by field clinicians, a pilot feasibility study, then evaluation of impact on outcome indicators.

Conclusion

In BVD, children die more often than adults, and part of this excess mortality stems from correctable factors: late fluid resuscitation, undetected hypoglycaemia, a procedure made impossible by missing equipment or untrained staff. The Patient–Provider–Environment model and the individualised pharmaco-clinical approach aim to make these factors visible and manageable. We call for a dedicated paediatric component within the outbreak response, and for its rigorous evaluation.

Declarations

Author contributions: KKP conceived the model and the proposal. MMM and the ASPIRE team contributed to the literature review, drafting and critical revision.

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