



Optimizing supportive care for CCHF - Lessons from Lassa, Ebola and Marburg

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Clinical question and talk architecture

Core thesis: supportive care is the most actionable lever for VHF and specially for CCHF today

Three linked aims

1 Demonstrate mortality signal

Which epidemics and cohorts show that better supportive care changes outcomes?

2 Disaggregate the bundle

Which domains are most plausibly responsible ?

3 Transposition to CCHF

What can be transferred now, what needs adaptation, and what remains low-evidence or speculative?

Methodological framework

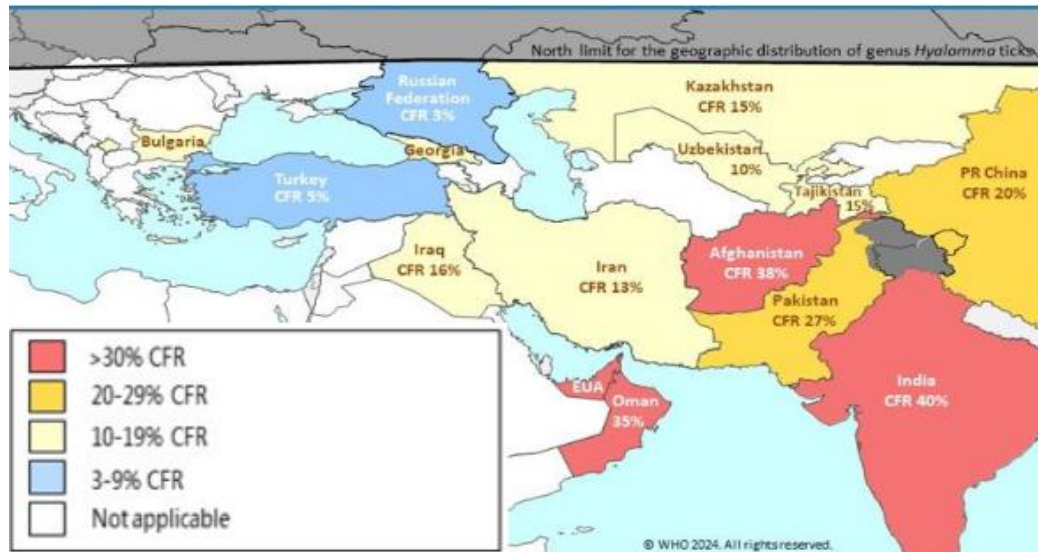
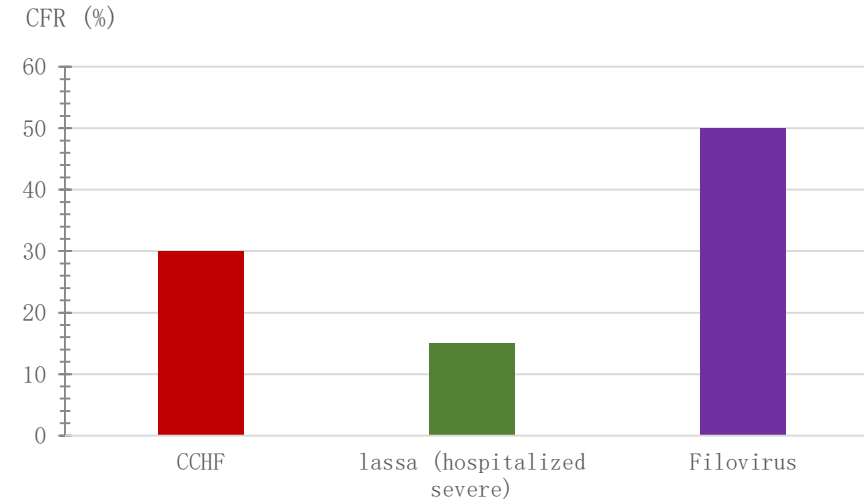
- Do not confuse literature volume with evidence level:
 - Ebola has the most structured evidence;
 - Lassa and CCHF rely more on prospective/retrospective cohorts and official guidance.
- Focus on human studies directly informative for supportive care, plus WHO/CDC/NCDC/NIH/NIV guidance
- Outcome hierarchy: mortality first, then severe complication prevention, then process metrics that make a CCHF trial platform credible.

Why supportive care is the decisive issue in CCHF ?

CCHF is the outlier with the narrowest therapeutic margin

- WHO:
 - No approved specific treatment
 - Ribavirin remains off-label and its efficacy is uncertain
 - Outbreaks can reach case fatality rates of up to 40% (5-40 %)
 - Average hospital lethality remains heavily context-dependent

WHO-reported severity landscape (CFR, %)



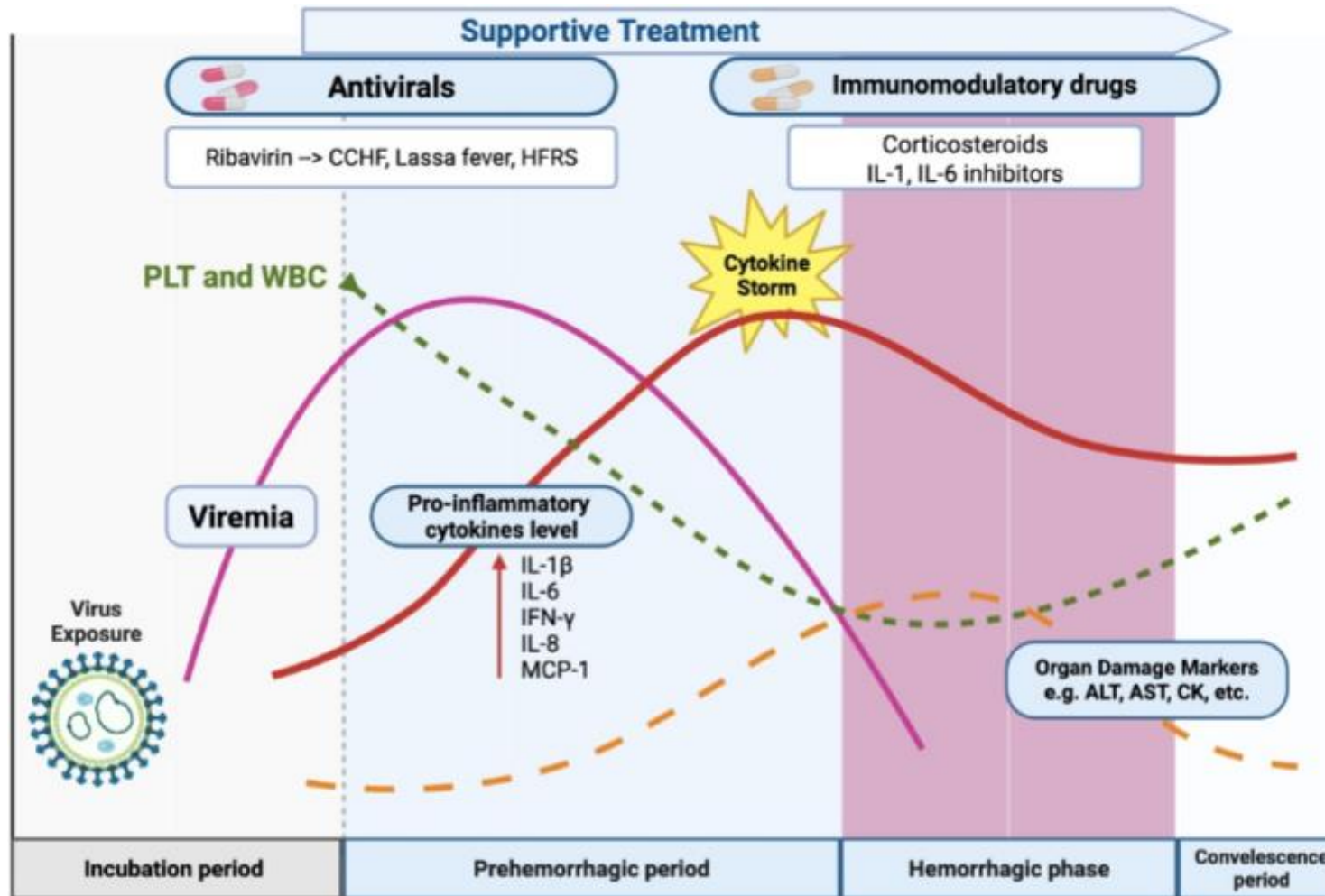
WHO, CCHF introduction 2024

Context matters more than virus name alone:

Marburg in Rwanda (2024) ran at ~ 23% CFR, far below historical extremes, while WHO still describes average CFR around 50%.

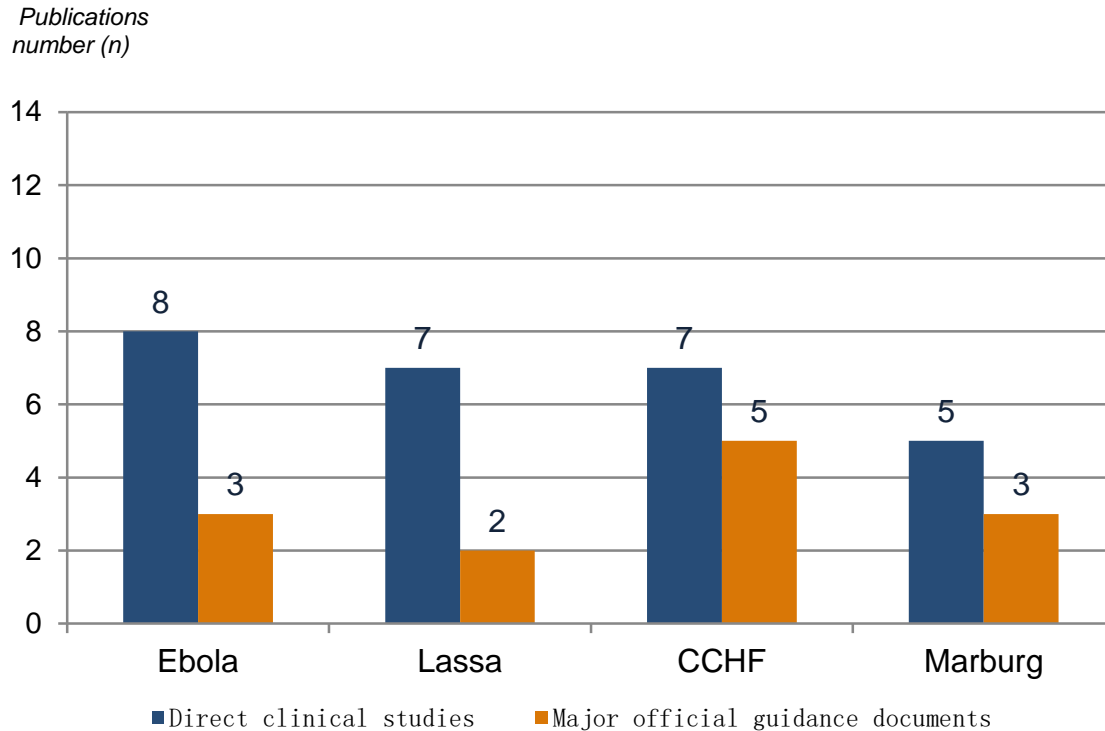
Why supportive care is the decisive issue in CCHF

What and when are supportive care ?



Deniz Güllü et al *Viral hemorrhagic fevers - therapeutic trial advances and challenges, Expert Review of Anti-infective Therapy, 2025*

Comparative evidence landscape: volume is not proof



Ebola anchors proof, Lassa anchors operations, CCHF needs translation

Evidence architecture

Virus	Best supportive-care evidence layer	Overall level
Ebola	GRADE guideline + multicenter cohorts	Highest
Lassa	Prospective/retrospective cohorts + national guidance	Intermediate
CCHF	Observational cohorts + broad official recommendations	Low - intermediate
Marburg	Recent outbreak cohorts + feasibility reports	Lowest direct evidence

Interpretation

- Ebola provides the only fully structured, evidence-based supportive-care guideline with formal recommendation strength.
- Lassa provides the most operationally explicit model of an optimized standard of care (oSOC) platform
- CCHF and Marburg rely more heavily on biological plausibility, observational cohorts, and implementation logic.

What “optimized supportive care” really means

Operational parameters from the Lassa oSOC example

- Assess every patient at least 3 times per 24 h.
- Target staffing ratio >1 clinician for 4 patients.
- Separate a dedicated area for critically ill patients and resuscitate immediately when danger signs are present.
- Daily / multi-daily biochemistry during the acute phase; point-of-care glucose at each shift; oxygen when SpO₂ <92%.
- Presumptive antibiotics on admission with 48-hour reassessment
- empiric antimalarial treatment until excluded or completed.

Why this matters for CCHF

This is precisely what is missing from most of the clinical series published on CCHF.



Standardization itself is an intervention



Part I - Is there a mortality signal ?

Why transposition is biologically plausible ?

Shared clinical failure modes across viral haemorrhagic fevers

Domain	Lassa	Ebola	Marburg	CCHF
Hypovolaemia / dehydration	+++	+++	++	++
Electrolyte / glucose derangement	+++	+++	++	++
AKI / multiorgan dysfunction	+++	+++	++	++
Shock / vasoplegia / hypoxia	++	+++	++	++
Bleeding / coagulopathy	+	+	+	+++
Nosocomial transmission risk	++	+++	+++	+++

Interpretive rule

- The more a domain reflects generic critical illness physiology, the safer the transposition to CCHF.
- The more a domain depends on disease-specific haemostasis biology, the lower the confidence in direct transfer.
- Hence: fluids, labs, oxygen, AKI prevention, triage and IPC are high-confidence domains; haemostatic adjuvants are not.

Transposition is strongest for reversible organ failure

Ebola: the strongest mortality signal

Why Ebola leads the hierarchy

- *Lamontagne et al.* produced the only supportive-care guideline built with a formal GRADE process.
- The guideline issued 8 recommendations:
 - **7 strong, 1 conditional.**
- Across the West African epidemic, CFR fell as supportive care, staffing, monitoring and logistics improved.

Exact causality remains confounded, but the directional signal is consistent.



Optimized Supportive Care for Ebola Virus Disease

CLINICAL MANAGEMENT STANDARD OPERATING PROCEDURES

Key operational implications for CCHF

- Supportive care is most effective when delivered as a platform, not as isolated interventions.
- Antibiotics, antimalarials, IV fluids, daily biochemistry, and bedside reassessment are not “extras”; they define the case-management platform.
- This is the most defensible template for a CCHF trial-ready standard of care.

**Ebola provides the clearest evidence
that structured supportive care
changes outcomes**

Lamontagne F, et al. Evidence-based guidelines for supportive care of patients with Ebola virus disease. Lancet. 2018

Marburg: Rwanda changed the benchmark

Rwanda 2024 outbreak

- **66 confirmed cases**
- **15 deaths**
- **≈ 23% case fatality ratio**

This is far below the historical Marburg range often cited in official communications.

- Implication: context of care can dramatically reshape apparent lethality.
- Recent reports describe safe delivery of ICU-grade care, including invasive ventilation and advanced monitoring, in high-consequence settings.

- Marburg does not yet provide a dense comparative evidence base; it provides proof of feasibility, and the strongest recent reminder that **high-consequence care can be delivered safely under outbreak conditions.**
- The practical message is not virus-specific: triage, logistics, staffing, oxygenation, organ support and IPC must be built as a single platform.
- For CCHF, where nosocomial transmission and severe bleeding remain major concerns, that platform logic is directly relevant.

Historical fatality can be modified by care context

This is a crucial caution against fatalistic interpretations of VHF hospital mortality including in poor outcome countries

The most immediately modifiable determinant is not an antiviral
Is the quality, timeliness, and consistency of supportive care !

Lassa: standardization, AKI prevention, and a trial-ready platform

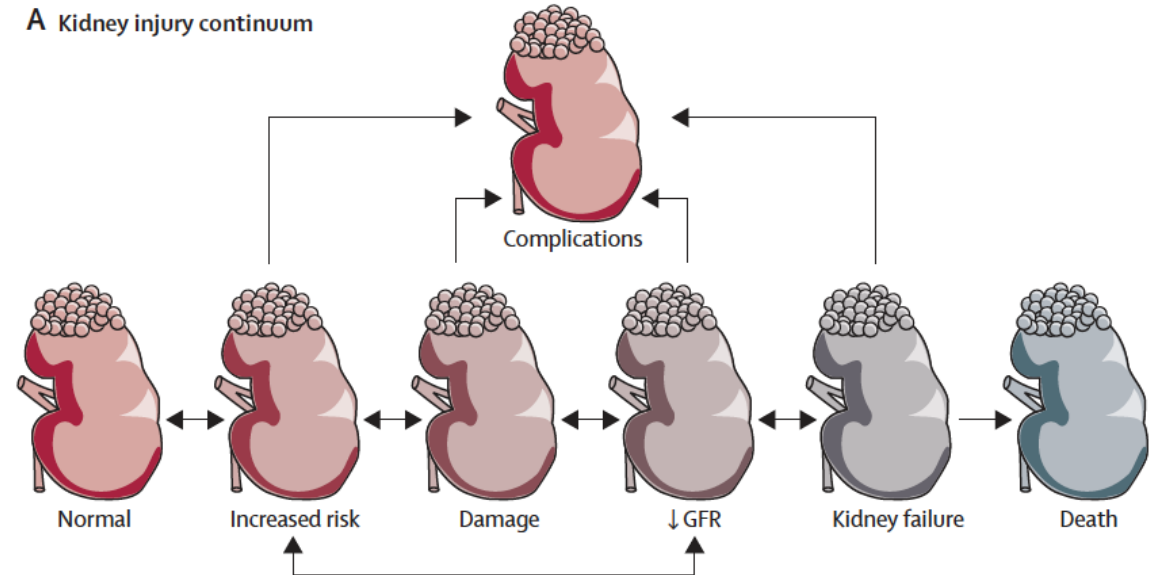
Most informative contemporary cohort

Duvignaud et al. / LASCOPE cohort :

- **510 patients**
- **2 % mortality**
- **8 % required dialysis**

- LASCOPE reframed optimized supportive care as a prerequisite for therapeutic trials, not merely bedside good practice.
- LASCOPE translates this into operational items: 1:4 clinician-to-patient ratio, ≥ 3 assessments/day, daily chemistry, aggressive volume/glucose/electrolyte correction, critical-care zone for danger signs.
- AKI emerges as a major, potentially preventable pathway to death.

RIFLE: The continuum of acute kidney injury



Lameire et coll. *Lancet*. 2008;372:1863-5



Part II - What within supportive care seems to work ?

Domain 1 - Triage, early isolation, and staffing intensity

Most actionable early mortality lever

- Across Ebola and Marburg, early admission to a treatment centre correlates with improved survival
- delayed recognition magnifies both mortality and transmission
- The Lassa oSOC operationalizes this into a critical-care zone for danger signs with formal reassessment at least three times per day.
- This should be read as a mortality intervention, not only as workflow engineering.

CCHF transposition

- Designate a “specific zone” / critically ill area within the treatment unit
- Define explicit danger signs
- Set minimum reassessment frequency
- **Protect the response team from cognitive overload through ratios and checklists**

Identification of patients at High Risk for Complications (LASCOPE example):

- Low systolic blood pressure or delayed capillary refill and cold extremities in a child
- Altered mentation or seizure
- **Tachypnea** (fast respiratory rate)
- Weak or rapid pulse
- **Oliguria** (urine output <0.5ml/kg/hour in adult, or < 1.0ml/kg/hour in a child) or anuria
- **Hemorrhagic manifestations**
- Severe hypoglycemia (glucose <54mg/dl or 3mmol/L)
- SaO₂ <92%
- **Severe electrolyte abnormalities**
- Severe weakness with inability to ambulate or eat/drink

Early placement into the right care zone is itself part of supportive care

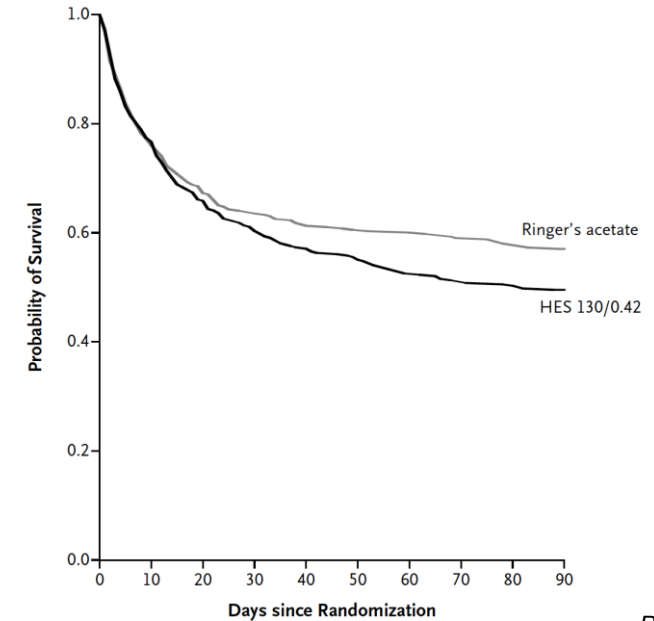
Duvignaud A, et al. LASCOPE pretrial protocol. Wellcome Open Res. 2020.

Lamontagne F, et al. Evidence-based guidelines for supportive care of patients with Ebola virus disease. Lancet. 2018

Domain 2 - Fluids, electrolytes, glucose, and AKI prevention

This is the single most coherent cross-virus domain

- Lassa oSOC explicitly recommends oral rehydration when feasible, clinically appropriate IV fluids (isotonic crystalloids serum) when not, daily biochemistry during the acute phase, and shift-based glucose monitoring.
- The Lassa oSOC argues for volume assessment with clinical examination plus point-of-care IVC ultrasound, isotonic crystalloids, and early prevention of AKI as a survival strategy.
- Ebola supportive-care guidance converges on the same core: ORS/IV fluids, biochemistry, electrolyte correction, glucose management, and repeated reassessment.



No. at Risk	0	10	20	30	40	50	60	70	80	90
HES 130/0.42	398	340	280	240	209	197	197	197	197	197
Ringer's acetate	400	350	300	254	240	240	240	240	240	228

Perner et coll. N Engl J Med 2012;367:124-134

CCHF inference

Among all candidate supportive-care domains, early correction of hypovolaemia, electrolyte derangements, hypoglycaemia and evolving AKI has the highest biological plausibility and the strongest cross-virus reproducibility. If one domain must be standardized first in CCHF, it is this one.

For CCHF, fluids + labs + AKI prevention should be the first standardized package

Domain 2 - Fluids, electrolytes, glucose, and AKI prevention

Ultrasound assessment of the Inferior Vena Cava for Volume Status

- The Caval Index (CI) and IVC size can be used as a method to estimate central venous pressure (CVP) with several studies supporting this correlation
- In resource limited settings direct catheter measurement of CVP is rarely available
- The following table can be used to roughly estimate CVP from IVC size and collapsibility.



IVC size and CVP		
IVC size (cm)	Respiratory change	CVP (cm H ₂ O)
< 1.5	Total collapse	0 - 5
1.5 - 2.5	> 50% collapse	6 - 10
1.5 - 2.5	< 50% collapse	11 - 15
> 2.5	< 50% collapse	16 - 20
> 2.5	No change	> 20

Nagdev AD et al. Emergency department bedside ultrasonographic measurement of the caval index for noninvasive determination of low central venous pressure. *Ann. Emerg. Med.* 2010

Kreuels, B. et al. A Case of Severe Ebola Virus Infection Complicated by Gram-Negative Septicemia. *New England Journal of Medicine*, 2014

- Ultrasound assessment of the IVC is a non-invasive, rapid, repeatable examination that can be performed at the patients' bedside.
- IVC measurements for intravascular volume status of adult patients or as an estimation of CVP are particularly useful for symptomatic undifferentiated hypotension, sepsis or dehydration.
- Serial IVC measurements can also be used to assess for blood loss in a trauma situation or monitor rehydration of a patient to reduce the risk of overload.
- At least one recent study reported of the use of US guided IVC measurements to guide fluid management

Domain 2 - Fluids, electrolytes, glucose, and AKI prevention

Vascular access issue

- A crucial step in monitoring and regulating fluid intake in order to address deficiencies and manage fluid and electrolyte imbalances
- Necessary if more intensive care is required or if oral intake is not possible (severe vomiting in the case of Ebola)
- But also, a major potential risk to healthcare staff

In Lassa oSOC

- Vascular access imaging device that illuminates the vein and can help the clinician find the optimal venipuncture site and avoid accidental exposure of the care-giver.
- It assesses IV patency during and after placement through visualization of fluid flushing and detection of a hematoma as it forms.



- Intraosseous infusion provides a non-collapsible entry point into the systemic venous system when IV access is not available or not feasible.
- Allow for the administered medications and fluids to go directly into the vascular system
- A comparison of IV, IM), and IO routes of administration concluded that the intraosseous route is demonstrably superior to intramuscular and comparable to intravenous administration

Luck RP et al. Intraosseous access. J Emerg Med. 2010 Oct;39(4):468-75.



Domain 3 - Oxygenation, shock, and organ support

From low-tech oxygen to ICU-level rescue

- Lascope treats oxygen capacity pragmatically: oxygen concentrator support when SpO₂ <92%, plus escalation to positive-pressure oxygen therapy when needed.
- CDC Ebola guidance extends the same logic into maintenance of oxygenation and blood pressure, vasopressor support, and management of refractory shock, hypoxia and multiorgan failure.
- Recent Marburg reports demonstrate that even invasive ventilation and advanced ICU-level support can be delivered safely in outbreak settings when the platform is built correctly.



What the implications for CCHF might be ?

The key is not whether every site can ventilate or dialyze; it is whether every site knows when to escalate, **and whether referral pathways to organ-support capability are preplanned.**

Supportive care must include an escalation pathway, not just bedside measures

Domain 4 - Bleeding, coagulopathy, and blood products

Clinically crucial in CCHF — but evidentiary extrapolation is weaker

What the Lassa experience says

- Haemorrhagic shock is treated with rapid source/mechanism identification and blood replacement to maintain oxygen-carrying capacity.
- Suggested target: maintain haemoglobin >7 g/dL.
- TXA is discussed cautiously; the evidence in LF/Ebola is insufficient and thrombosis is a concern.

What can be carried over

- Define explicit transfusion thresholds and pathways.
- Secure access to red cells, plasma and platelets where possible.
- Treat active bleeding and haemorrhagic shock as escalation triggers.

What should not be overstated

- No strong cross-virus evidence supports routine haemostatic adjuncts such as TXA in viral haemorrhagic fevers.
- CCHF-specific coagulopathy is more central than in Lassa or Ebola, so extrapolation should be conservative.
- This domain needs dedicated CCHF data, not simple borrowing.
- The main uncertainties concern the actual hierarchy of the mechanisms involved, the precise role of platelets, the tissue-level expression of circulating biomarkers, and how to use this information to develop an effective, targeted haemostatic therapy

**Transfusion logic is transferable
hemostatic adjunct logic is not**

Domain 5 - Co-infections, empiric anti-infectives, nutrition, symptom control

Empiric anti-infectives

Lassa oSOC: empiric antibiotics on admission, then reassess after 48 h.

Ebola cohorts suggest lower mortality with selected empiric antibiotic strategies in severe disease.

*54.7% Mortality among those treated with cefixime
VS
73.4% among those not treated*

Antimalarial cover

Lassa oSOC: empiric antimalarial treatment until the course is complete or malaria is excluded.

Ebola observational data also suggest benefit in co-endemic settings.

*55.1% Mortality with early oral antimalarial treatment
VS
77.1% without*

Nutrition / glucose

Enteral nutrition when tolerated;
IV dextrose when oral intake is impossible and/or hypoglycaemia is present.
This is operationally simple and biologically relevant.

Symptom prevention

Fever, pain, nausea, pressure-ulcer prevention and catheter-care are not “comfort medicine”; they help, preserve the platform and prevent secondary harm.

**For CCHF, the transposable principle is pragmatic stewardship:
treat what cannot safely be excluded on day 0
then de-escalate on reassessment +++**

Aluisio AR et al, Association between treatment with oral third-generation cephalosporin antibiotics and mortality outcomes in Ebola virus disease: a multinational retrospective cohort study. Trop Med Int Health. 2020.

Abel L, et al, Association between oral antimalarial medication administration and mortality among patients with Ebola virus disease: a multisite cohort study. BMC Infect Dis. 2022.

Domain 6 - IPC is part of case management, not a parallel stream

Why this matters for CCHF

- In all four diseases, delayed diagnosis and **unsafe care amplify mortality** through **nosocomial spread, staff depletion, and procedural hesitation.**
- Recent Marburg experience underscores that IPC, staffing, logistics and monitoring must be built together.
- Otherwise even simple supportive measures become hard to deliver safely.



Source: WHO, jan 2019

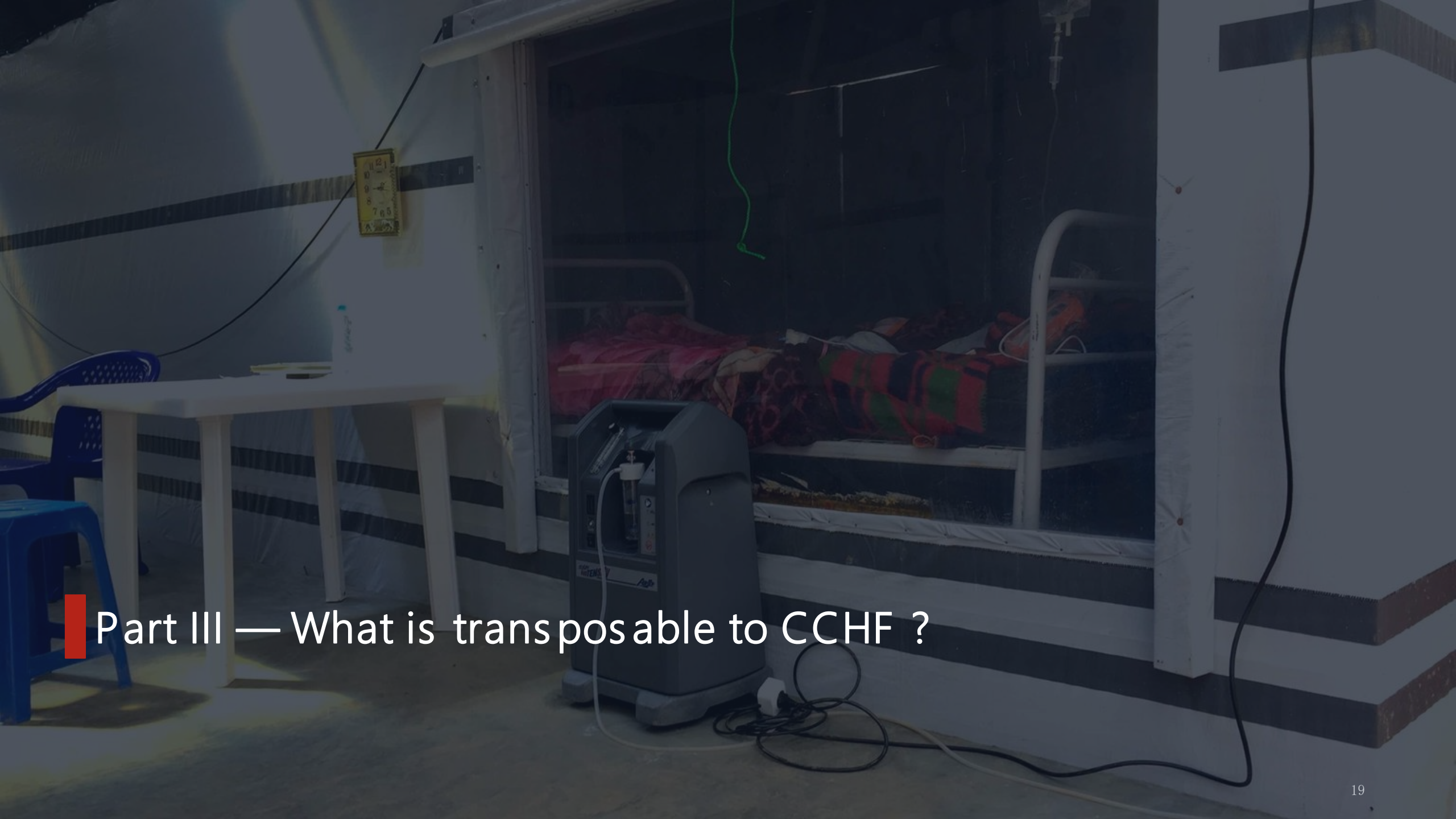
If IPC fails, the supportive-care platform fails



*“Intense internal debate within MSF over the quality of Ebola care”
02/27/2015*

Excessive caution can lead to reduced adherence to treatment and undermine the standardization and reproducibility of care.

Stelfox HT et al Safety of patients isolated for infection control. *JAMA*. 2003
Morgan DJ et al Adverse outcomes associated with Contact Precautions: a review of the literature. *Am J Infect Control*. 2009.
Loignon C et al, Barriers to supportive care during the Ebola virus disease outbreak in West Africa: Results of a qualitative study. *PLoS One*. 2018.
Fowler RA et al, Caring for critically ill patients with ebola virus disease. *Perspectives from West Africa. Am J Respir Crit Care Med*. 2014.



■ Part III — What is transposable to CCHF ?

High-confidence transpositions to CCHF

CCHF candidate domain	Confidence	Why
Rapid triage and isolation	High	Supported across all FHV and in official CCHF IPC guidance.
Structured reassessment and minimum staffing ratios	High	Operationally explicit in Lassa oSOC; biologically generic.
Oral/IV fluids + electrolyte/glucose correction	High	Most coherent cross-virus domain.
AKI prevention and planned escalation for dialysis / ICU	High	Strong in Lassa; plausible and relevant in CCHF severe disease.
Empiric management of co-infections with reassessment	Moderate–high	Ebola/Lassa support; directly useful in endemic settings; highly contextual
Oxygen support and escalation pathway	Moderate–high	Strong biologic plausibility and outbreak feasibility data.

These elements should not wait for CCHF-specific randomized evidence before being standardized.

Start with generic critical-care physiology and auditable workflows

Context-dependent transpositions

Adapt

Blood products / transfusion pathways

Depends on availability, local thresholds, and severity mix

Adapt

ICU-grade ventilation

Feasible, but only in high-consequence referral centres

Adapt

Dialysis / renal replacement therapy

Potentially lifesaving, but referral and infection-control logistics are determinant

Adapt

Point-of-care ultrasound

Highly attractive for volume assessment, but training-sensitive

Adapt

Broad-spectrum anti-infective strategy

Useful where differential diagnosis is broad; **requires stewardship discipline**

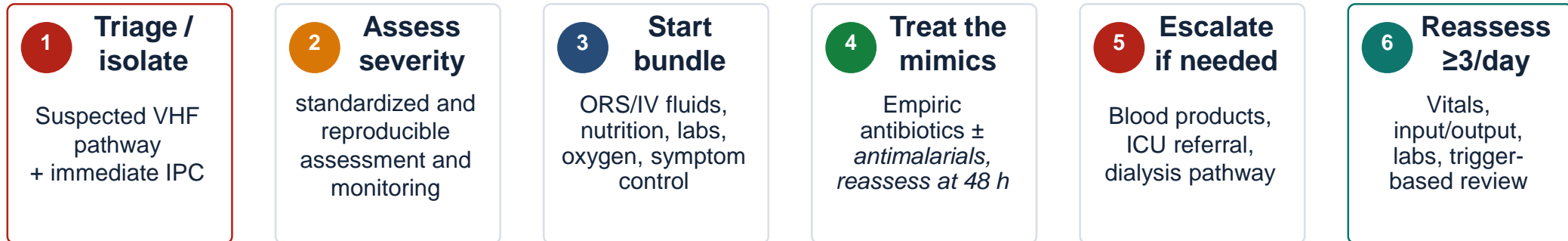
What should not be over-transposed to CCHF

- Do not import Ebola-specific therapeutic success (e.g., monoclonal antibodies) into the supportive-care discussion for CCHF.
- Do not infer that haemostatic adjuncts such as TXA are evidence-based in CCHF simply because bleeding is more prominent.
- Methodologically:
 - we should not present ribavirin as though the uncertainties surrounding supportive care had been resolved by an antiviral

Reason

In CCHF, the temptation to over-interpret disease-specific haemorrhage or under-interpret general organ-support principles is exactly what a rigorous transposition framework should prevent.

A proposed CCHF optimized supportive-care bundle



Minimal auditable process indicators

- Arrival-to-isolation time
- First fluids time
- First biochemistry biology time
- Documented fluid losses (urine)
- Documented reassessment frequency
- Escalation-to-referral time
- staff exposure incidents

A CCHF bundle must be protocolized, measurable, and referral-aware

Key messages for expert clinicians: state the obvious

- 1. Supportive care is the main therapeutic platform for CCHF today
- 2. Filovirus provides the highest-grade evidence that structured supportive care changes outcomes; Lassa provides the most explicit operational blueprint.
- 3. The most defensible CCHF transpositions:
 - early triage, isolation, staffing, fluids, daily/serial laboratory monitoring, glucose/electrolyte correction, AKI prevention, oxygenation, and planned escalation pathways
 - co-infection management should be assessed.
- 4. Bleeding management is clinically central in CCHF, but disease-specific evidence remains thinner:
 - Direct extrapolation should be most cautious
- 5. The next step is not another narrative review - it is a protocolized, auditable CCHF supportive - care / standard of care.



Thank you for your attention

Now let's get the discussion started !

Hepatic cytolysis with rhabdomyolysis

- ASAT or ALAT > 5 to 10 times the normal value
- CK $> 2,000$ U/L.
- Action: halve paracetamol doses or even stop completely due to the risk of increased liver cytolysis.
- Note: poor prognosis (tissular breakdown, viral expansion, advanced disease, harbinger of a bad outcome).

Hyperkalemia

- Hyperkalemia is a serious complication associated with arrhythmias and/or death and extremely difficult to manage in the context of LF, since diarrhea associated with the disease complicates the use of Kayexalate® and dialysis may not be available.
- Most hyperkalemia in patients with LF are due to renal impairment and/or false causes such as hemolysis of the blood sample.
- Monitor the ECG: maximum T-wave, QRS widening and flattening of P-wave loss of P-wave, progressive QRS widening and possible ventricular fibrillation.
- Eliminate the causes of false hyperkalemia: EDTA contamination, hemolysis of the sample...
- Ensure that all drugs that could potentiate hyperkalemia are stopped.
- Monitor blood glucose (30 min) and potassium (60 min) when corrected with insulin or serum glucose until normalization and stabilization.

Hypokalemia

- Serious complication associated with arrhythmias and/or death, but caution should be exercised when correcting it.
- When well tolerated (no vomiting), oral potassium should be used.
- Never give IV potassium bolus.
- In adults, the maximum flow of IV potassium through the peripheral venous route is 10 mmol/hour. Any decrease of 0.1 mmol in serum requires about 10 mmol of KCl in adults to be corrected.

In children, the maximum concentration of potassium by the IV route on peripheral catheters is 10 mmol/L.

- The maximum rate of IV infusion in children is 0.5 mmol/kg/hour.
- It is preferable to infuse potassium with an electric syringe pump to control the flow rate.
- Each gram of potassium in a 10 mL (1 gram) ampoule is equivalent to 13.4 mmol or 13.4 mEq of potassium.

Hyponatremia

- Hyponatremia is often observed in patients with LF and may be associated with disturbances of consciousness and/or convulsions.
- Management should be guided by the state of hydration, the duration of hyponatremia and the severity of symptoms.
- Crystalloid solutions used for resuscitation and basic intakes must be isotonic and include either 0.9% saline or Ringer lactate.
- Hypotonic solutions or open water should be avoided as they will precipitate hyponatremia. Use ORS for oral rehydration.
- Determine the etiology of hyponatremia according to hydration status: hypovolemic, normovolemic, hypervolaemic.
- In case of hypovolemia: fluid resuscitation (as described above). In case of normovolemia, avoid open water. Treat the underlying pathology.
- In case of hypovolemia, diuretics can be used.
- Do not correct hyponatremia quickly because too rapid a correction can lead to centro-pontine myelinolysis.
- The maximum correction rate is 9 mmol / L in 24 hours.
- Any clinical change should result in a new assessment of the hyponatremia.

Hypernatremia

- Hypernatremia is due to a water loss or hypertonic sodium intake. During EPM, it is most often due to a net loss of water (dehydration) due to diarrhoea / vomiting.
- The first symptoms are anorexia, muscle weakness, agitation, nausea and vomiting, thirst.
- More serious signs follow, with unconsciousness, lethargy, irritability, stupor and coma.

Acute Kidney Impairment (AKI)

- ARF is common in patients with LF.
- Data collected in West Africa suggest that etiology is probably a mixture of pre-renal causes (hypovolemia by digestive loss) and intrinsic renal impairment (acute tubular necrosis related to severe hypovolemia, hypotension, direct infection with LF virus, or myoglobin pigment damage).
- In the absence of renal replacement therapy, prevention of acute renal damage or complications of AKI is essential to improve outcomes.
- The prevention of AKI related to hypovolemia is based on close monitoring of dehydration and its treatment.

Acute Kidney Impairment (AKI)

- Identify AKI: creatininemia ≥ 0.3 mg/dL within 48 hours or decreased urinary output (< 0.5 mL/kg for 6 hours in adults or < 1 mL/kg for 6 hours in children).
- Monitor urine output. Consider the urinary catheter..
- Assess reversible causes of acute renal failure: treat accordingly.
- Ensure good volume supply: maintain renal perfusion with adequate crystalloid fluid resuscitation and vasopressors.
- Correction of electrolyte disorders.
- Prevent other causes of AKI: avoid nephrotoxic drugs, such as NSAIDs, aminoglycosides, IEC inhibitors.
- Never use diuretics to stimulate diuresis in a dehydrated patient.
- If resources are available (experienced staff, equipment and supplies), the use of renal replacement therapy may be considered

Acute Kidney Impairment (AKI)

- **Supra-renal failure**
- Urea (BUN) much higher in proportion than creatinine.
- Ex: Urea 75 mg/dL, creatinine 4 mg/dL.
- It is a failure of kidney irrigation by hypovolemia, the kidney itself is not affected.
- Action: Increase daily hydration, for example, in the absence of heart failure, give 60 mL/kg/day.
- Note: This type of kidney failure is much more common than the next one. It is not pejorative.

Acute Kidney Impairment (AKI)

- **Organic kidney failure**
- Normal or slightly elevated urea (BUN) + much higher creatinine levels
- Ex: Urea 35 mg/dL, creatinine 4 mg/dL.
- It is an attack of the renal parenchyma itself, and not a failure of kidney irrigation by hypovolemia.
- Reduce Ciprofloxacin doses by half due to the risk of accumulation, stop gentamycin and other nephrotoxic drugs.
- Reduce potassium intake if patient urinates.
- Stop potassium intake if the patient no longer urinates.
- Note: poor prognosis, especially if associated with rhabdomyolysis (CPK > 5000 U/L) and hepatic cytolysis.

Haemoconcentration

- Hemoglobin > 15 g/dL or hematocrit $> 45\%$.
- Such high values, while local populations are poor, indicate particularly high hemoconcentration and therefore extracellular dehydration.
- Action: hydration per os (clear water or ORS or both alternately to avoid disgusting the patient or intravenously (Ringer lactate, saline serum, mixed serum) in case of vomiting or both.

Multivisceral end-of-life failure

- Some biological parameters, associated with the patient's clinical condition (coma, tachycardia $> 120/\text{min}$, thready pulse, respiratory rate $> 30/\text{min}$, anuria, massive hemorrhages) announces death within 24 hours.
- Several deep biological anomalies are then associated.
- These may include hypoglycemia, renal failure, hyperbilirubinemia, hypoalbuminemia, generalized (hepatic) cytolysis, hypocalcemia, CRP elevation.
- Anemia (Hemoglobin or HGB < 5 or 6 g/dL and thrombocytopenia (Platelets or PLT $< 30,000 \times 10^3 /\mu\text{L}$), contemporaneous with a bleeding syndrome, may also be observed.
- Action to be taken: it is illusory to continue hydro-electrolytic resuscitation.
- It is important to ensure that the patient ends his life with dignity, without suffering (consider using Morphine) and inform the family of the imminent death.