

Frugal Innovations in Emergency Medicine: Bridging Critical Resource Gaps in Resource-Limited Settings

Three evidence-informed solutions to common barriers in emergency care

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Background

Emergency care in resource-limited settings is constrained by limited .access to blood products, advanced equipment, and reliable infrastructure
Frugal innovations can help overcome these system-level barriers and .expand access to life-saving care



Aim

To illustrate three frugal innovations through clinical scenarios and to evaluate their mechanisms, potential benefits, and current evidence in .addressing critical gaps in emergency care



02:00 AM

RECOGNITION BARRIER

Postpartum Hemorrhage

Delayed recognition and control of massive bleeding.



Clinical Scenario
A 28-year-old woman presents with heavy bleeding shortly after delivery in a rural hospital with limited resources.

Unmet Clinical Need

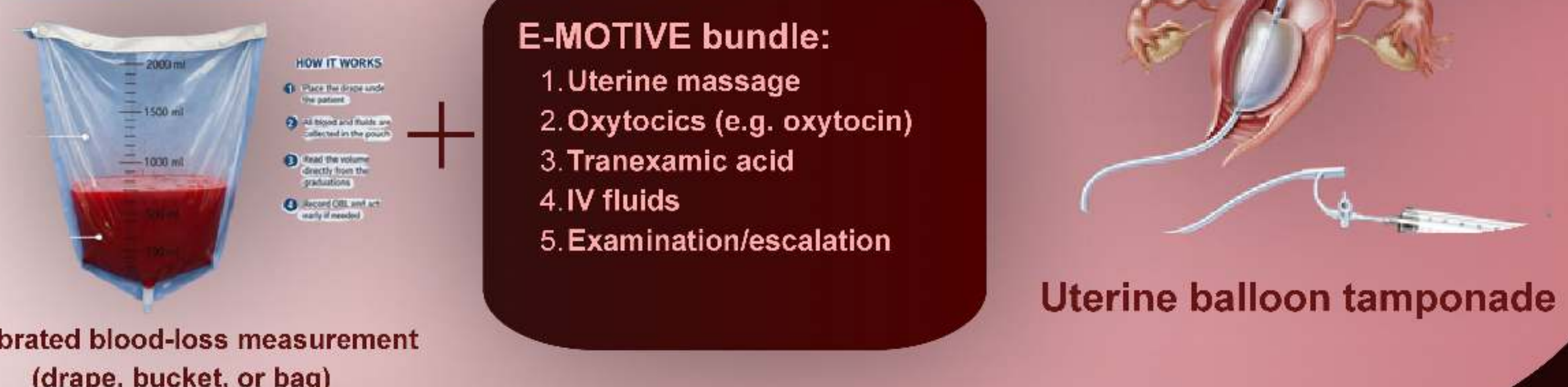
- Underestimation of blood loss
- Delayed recognition and intervention
- Limited access to advanced hemorrhage control

Frugal Innovation

E-MOTIVE early detection bundle with uterine balloon tamponade for persistent bleeding.

How it works

A simple tool for accurate blood loss measurement. Every mark counts. Every milliliter matters.



E-MOTIVE bundle:

1. Uterine massage
2. Oxytocics (e.g. oxytocin)
3. Tranexamic acid
4. IV fluids
5. Examination/escalation

Uterine balloon tamponade



05:00 PM

SUPPLY BARRIER

Traumatic Hemorrhage

Lack of immediate access to donor blood.



Clinical Scenario
A 35-year-old man presents with traumatic bleeding after a road traffic accident in a low-resource hospital without blood bank facilities.

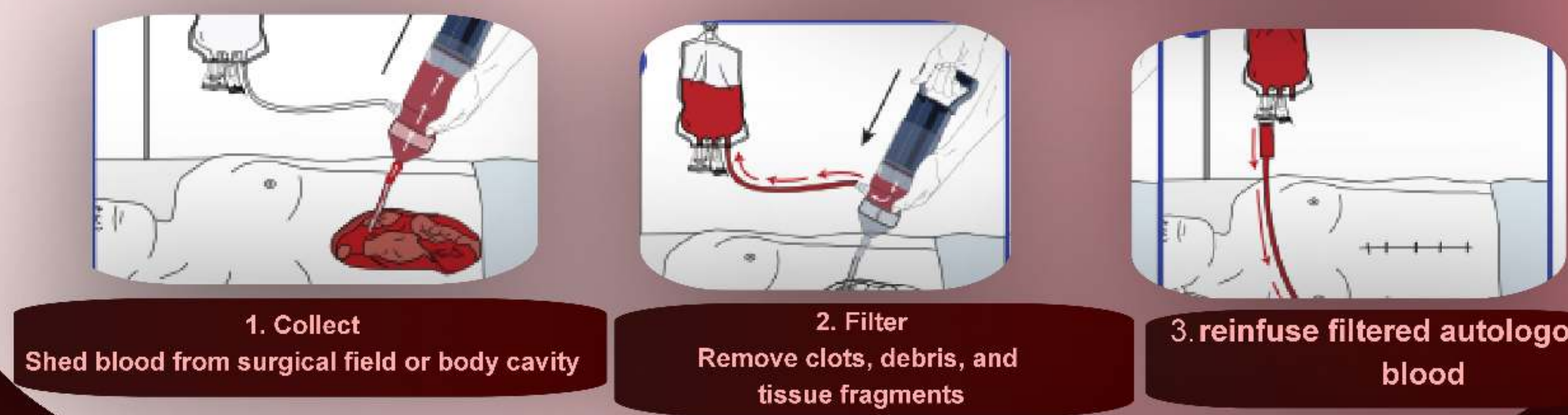
Unmet Clinical Need

- Lack of immediate access to donor blood
- High risk of death from uncontrolled hemorrhage
- Dependence on external blood supply

Frugal Innovation

Hemafuse – Autotransfusion technology for blood-constrained environments
A portable device that enables collection, filtration, and reinfusion of the patient's own shed blood when conventional blood supply is unavailable.

How it works



1. Collect
Shed blood from surgical field or body cavity
2. Filter
Remove clots, debris, and tissue fragments
3. reinfuse filtered autologous blood



12:00 AM

INFRASTRUCTURE BARRIER

Acute Respiratory Failure

Lack of electricity and mechanical ventilators.



Clinical Scenario
A child presents with severe respiratory distress due to pneumonia in a remote hospital with no electrical supply and no mechanical ventilator.

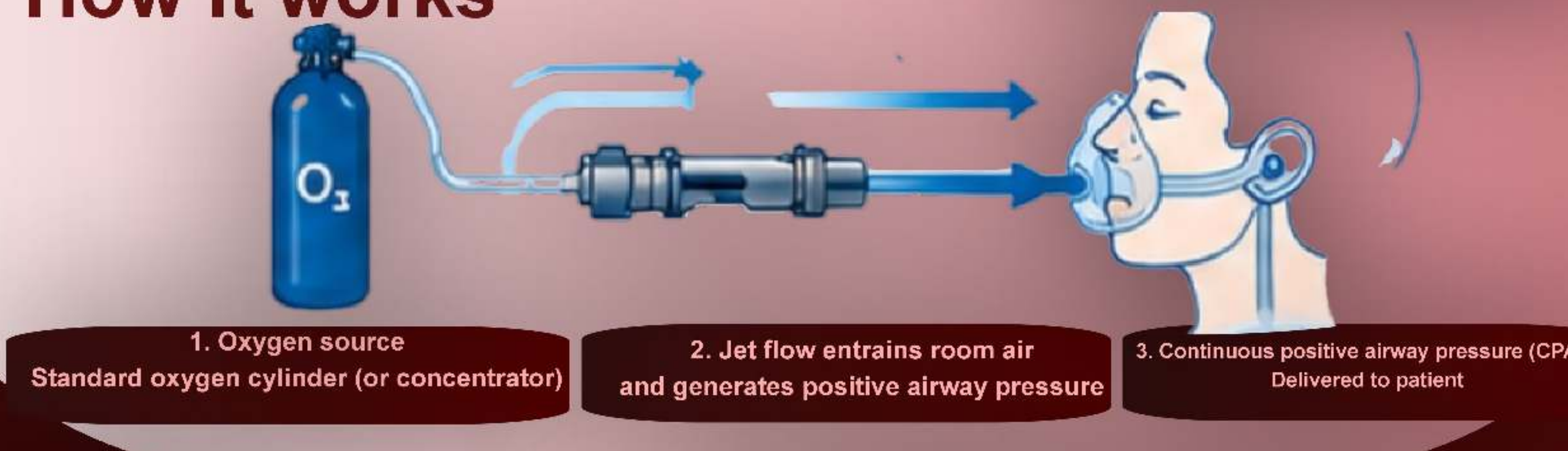
Unmet Clinical Need

- Unreliable electricity and limited respiratory devices
- High risk of respiratory failure and mortality
- Limited options for continuous airway support

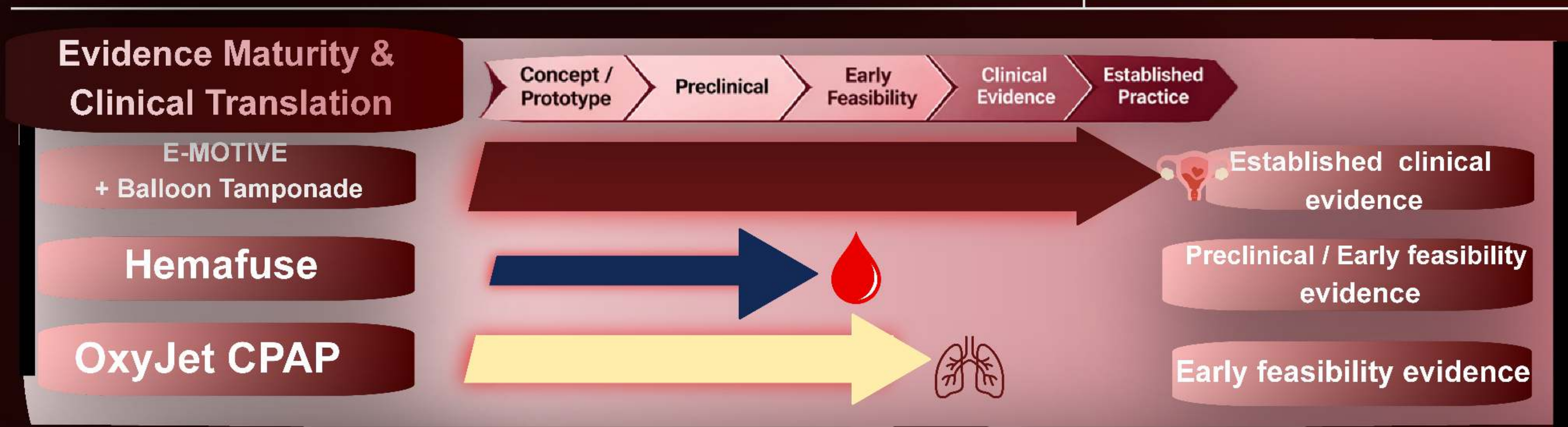
Frugal Innovation

OxyJet CPAP – a low-cost, oxygen-powered CPAP device that does not require electricity.

How it works



1. Oxygen source
Standard oxygen cylinder (or concentrator)
2. Jet flow entrains room air and generates positive airway pressure
3. Continuous positive airway pressure (CPAP)
Delivered to patient



Key Findings

- Supported by randomized clinical evidence demonstrating improved recognition and early management of postpartum hemorrhage.
- Preclinical testing demonstrated the feasibility of blood recovery and reinfusion using Hemafuse; human clinical effectiveness remains under evaluation.
- Initial evaluations suggest feasibility of providing respiratory support without electrical infrastructure.

Remaining Challenges

- clinical validation.
- Integration into existing emergency care systems.
- Training and maintenance requirements.
- Adaptation to different resource-limited environments.

Next Steps

- Larger clinical studies.
- Real-world implementation studies.
- Integration into emergency care pathways.

References

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