

Ventilators for Panama Initiative

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INDICASAT AIP

Foro PTB-COVID
Feb 24, 2021

INDICASAT AIP

Research and Education
based in Innovation

- We believe in the power of research and education to elevate the human condition and create leaders that can face the challenges of the XXI century.

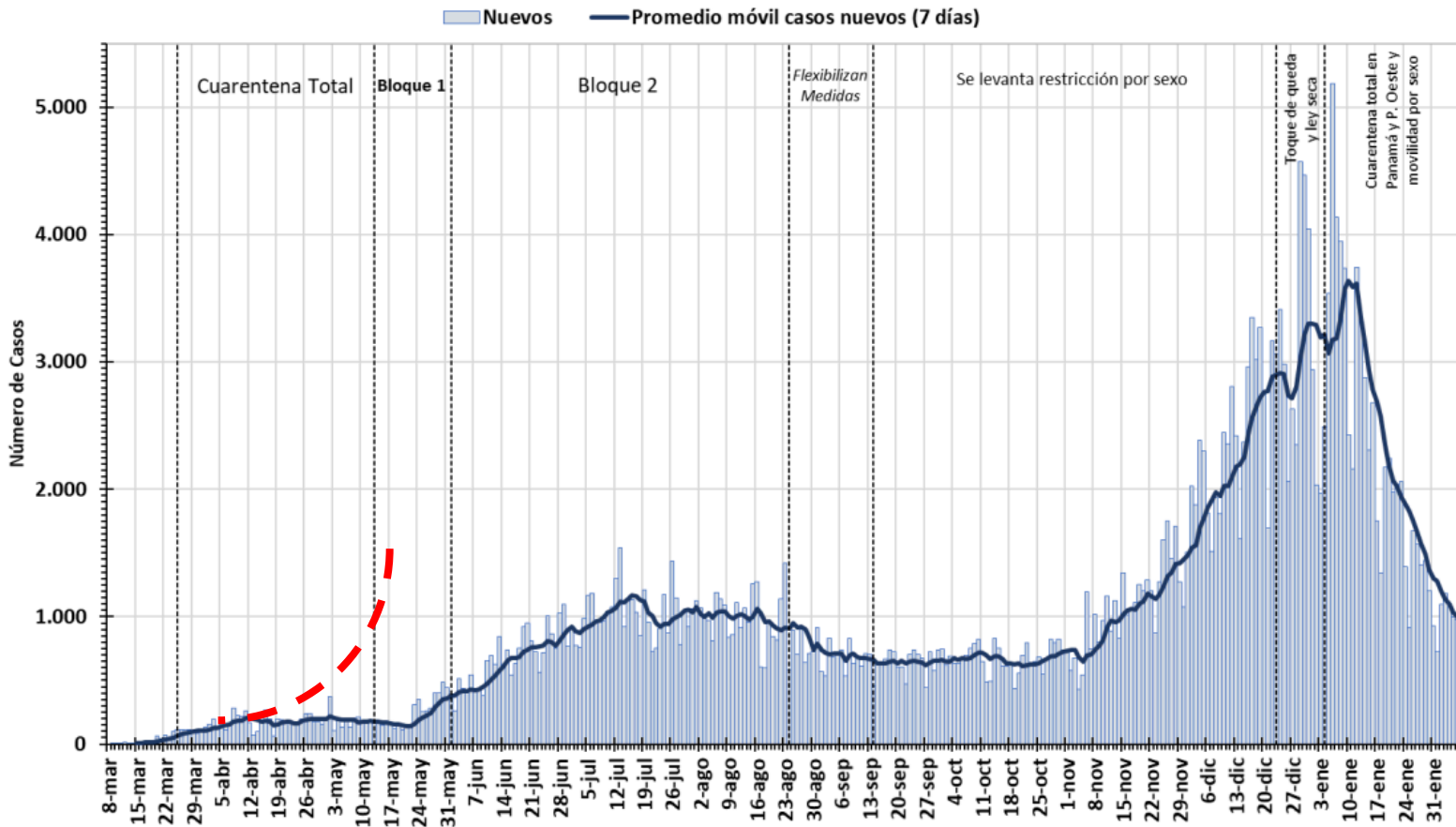








COVID-19: Epidemiologic Curve in Panama (Feb 6, 2021)



Confirmed Cases:

337,087*

Deaths:

5,756*

Total Tests:

1,856,433*

Beds in ICU:

589 (32% available)

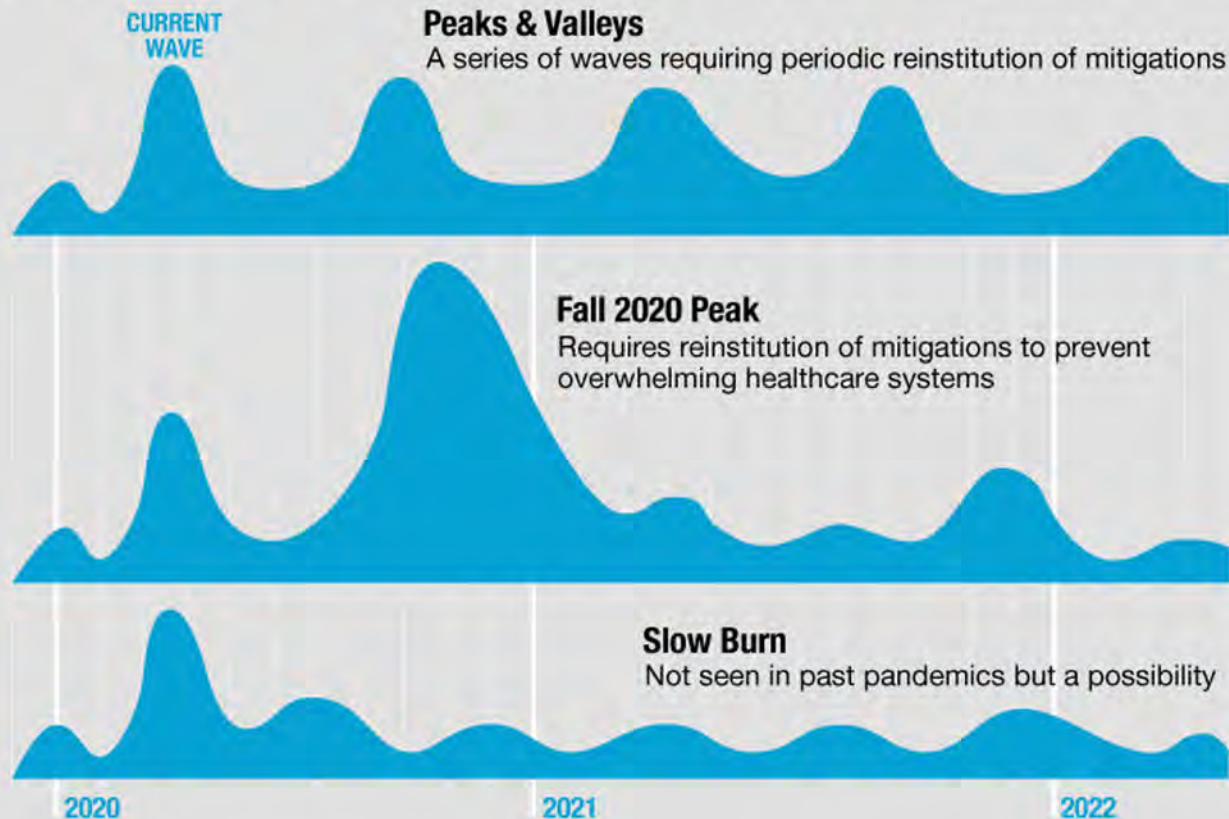
Ventilators:

892 (62% available)

*as of Feb 22, 2021

Pandemic Possibilities

Potential waves of Covid-19 infections in the Northern Hemisphere, in three scenarios based on past influenza pandemics and the known spreadability of Covid-19. Among the wildcards that would affect each scenario: starting and stopping preventive mitigations.



SOURCE: CIDRAP, University of Minnesota, Kristine A. Moore et al.

GRAPHIC BY ROBERT ROY BRITT

Ventilators for Panama Initiative: Coordination Committee



Dr. Julio Escobar
Ministerio de la Presidencia



Dr. Víctor Sánchez
SENACYT



Dr. Eduardo Ortega-Barría
SENACYT



Dr. José Trujillo
Intensivista / CSS



Dr. Fernando Alfaro
Intensivista / CSS



Dr. Xavier Sáez-Llorens
Infectólogo / Hosp. del Niño



Dr. Rolando A. Gittens
Bioingeniero / INDICASAT



Dra. Elida de Obaldía
Física / UTP



Gilberto Gómez
Políticas Públicas

Ventilators for Panama Initiative: Engineering Teams

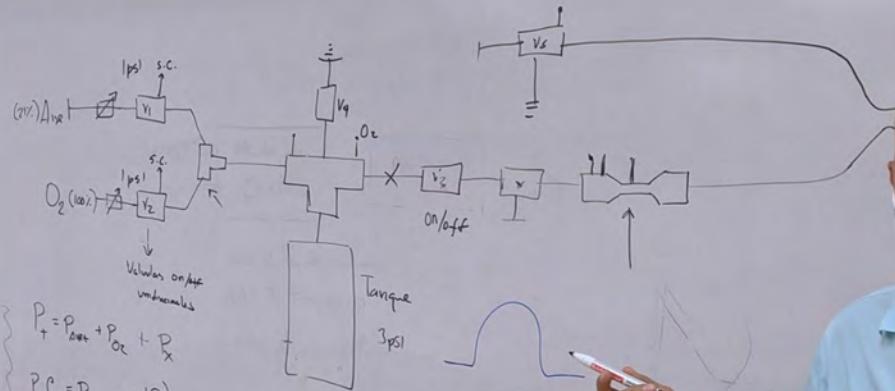


**Fundación
100 Panas**



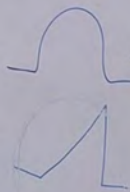
OxyGEN

**Fundación
Somos
Momento**



$$P_T = P_{loss} + P_{ex} + P_x$$

$$P_T C_2 = P_{T_{ex}} + 0.21(P_d)$$



Handwritten notes on the right side of the whiteboard, including the number '3' and the value '1.7 27'.

Líneas de gas

Líneas de control

(Opcional)

Design Criteria

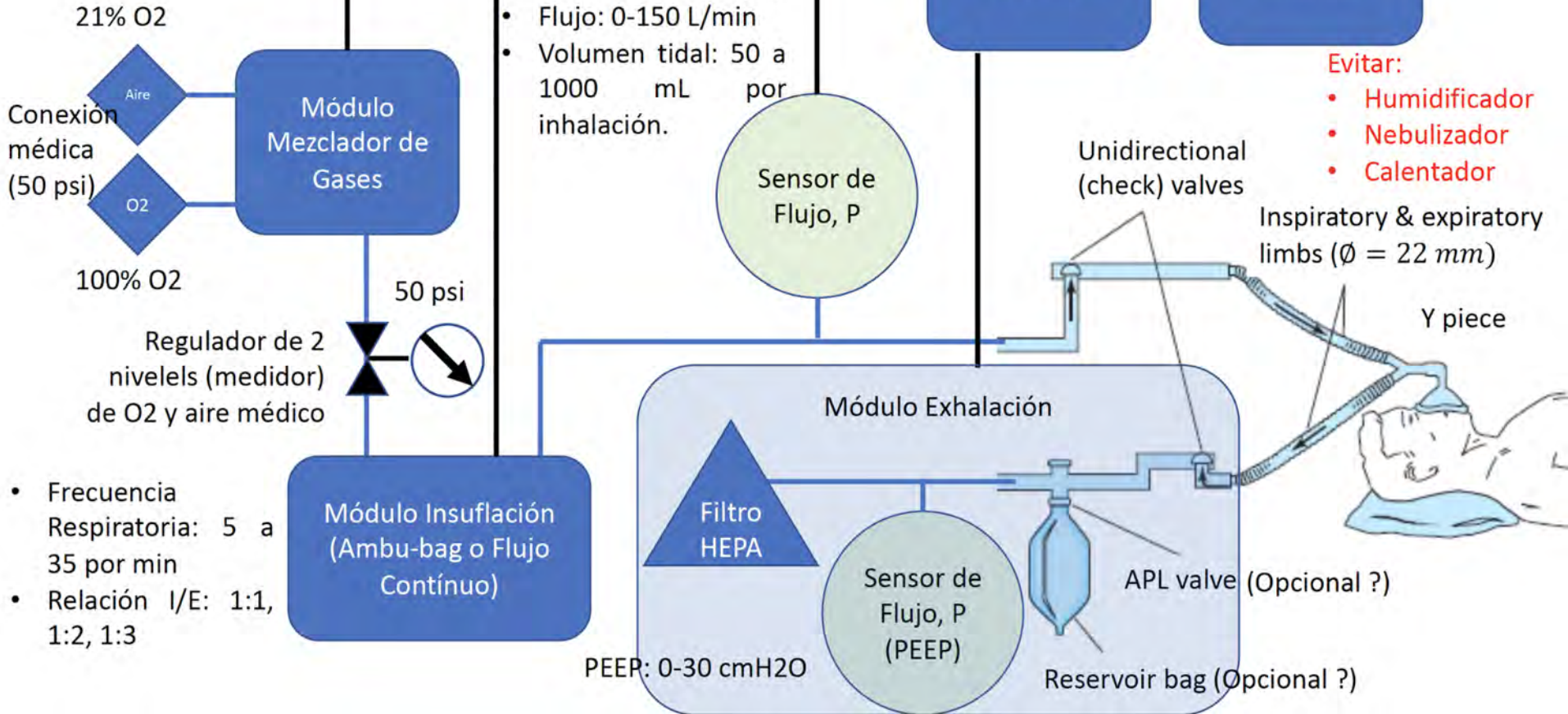
- P: 0-60 mmH₂O (0 a 60 mBar o 0.860 psi)
- Flujo: 0-150 L/min
- Volumen tidal: 50 a 1000 mL por inhalación.

Módulo Control

Módulo Interfaz

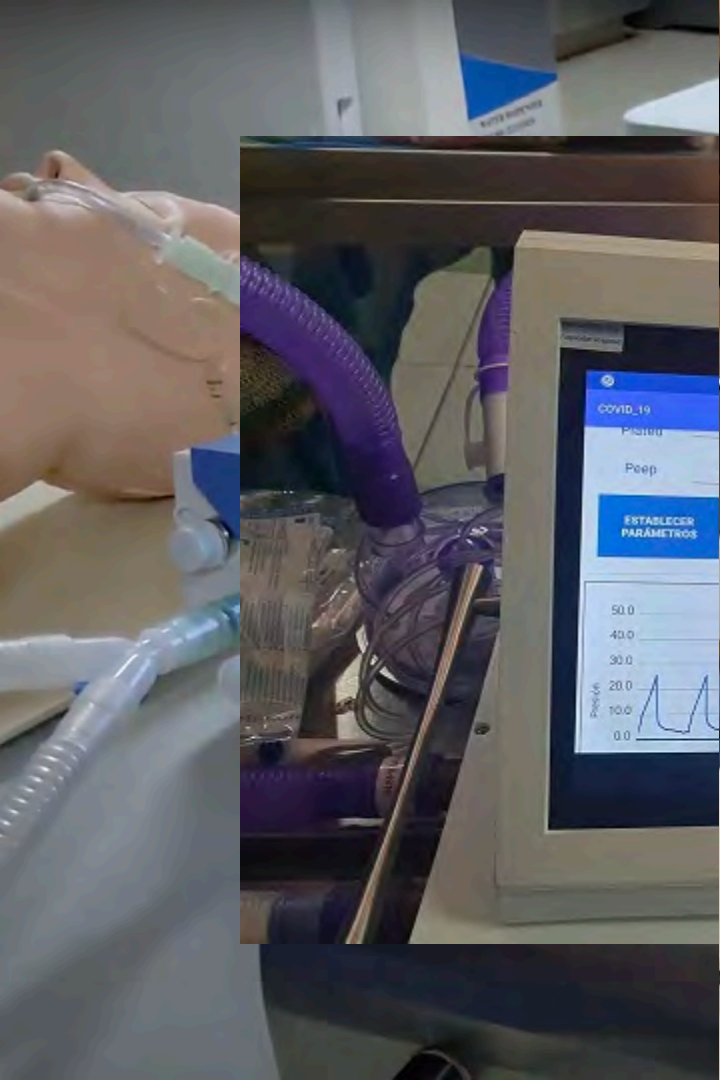
Evitar:

- Humidificador
- Nebulizador
- Calentador



- Frecuencia Respiratoria: 5 a 35 por min
- Relación I/E: 1:1, 1:2, 1:3





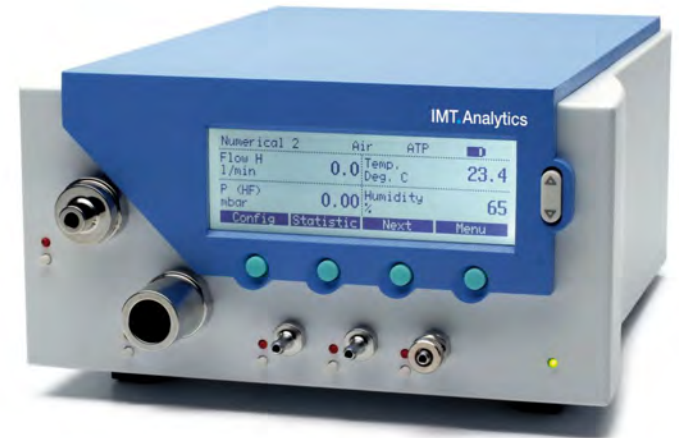
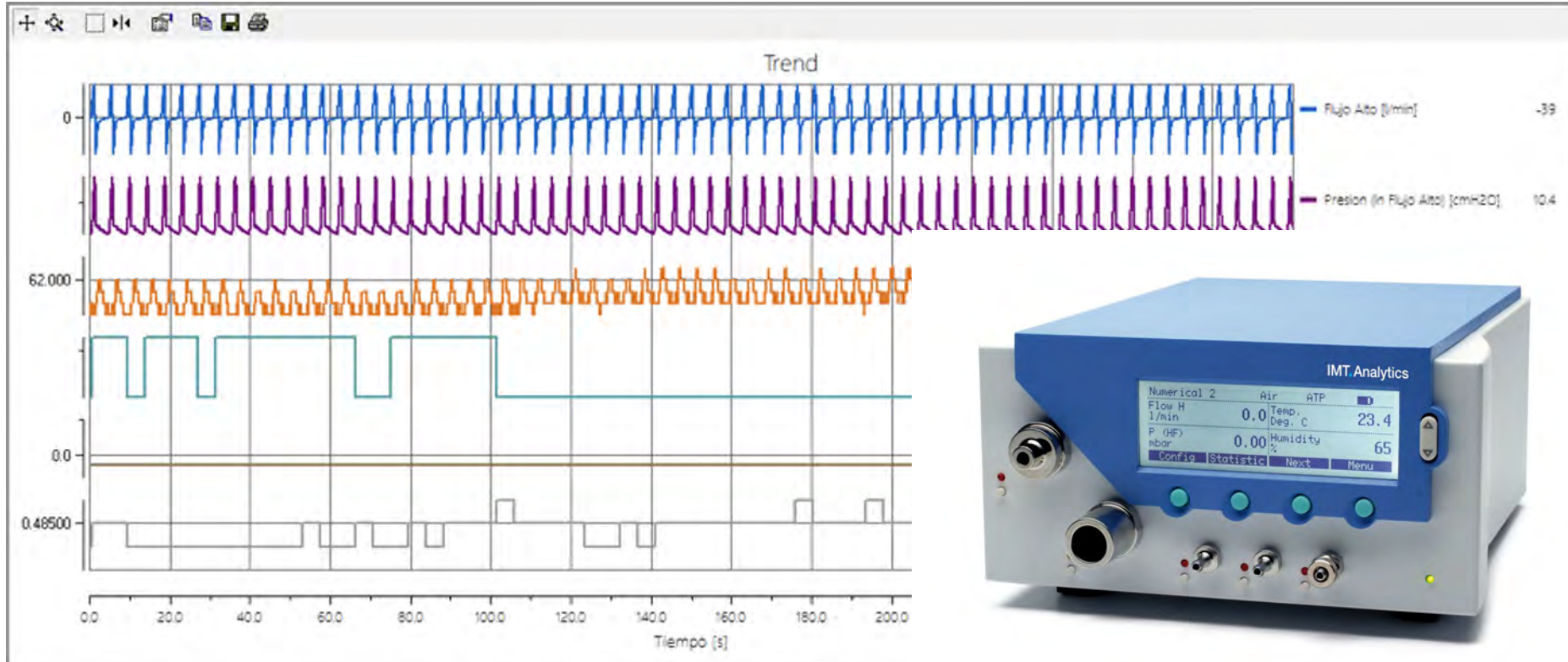
Validation Tests: Three (3) Phases



- **Phase 1: Functional Tests with medical simulation mannequins.**
- **Phase 2: Preclinical evaluation with healthy animals.**
- **Phase 3: Preclinical evaluation with a lung injury model to simulate breathing difficulties from COVID-19.**



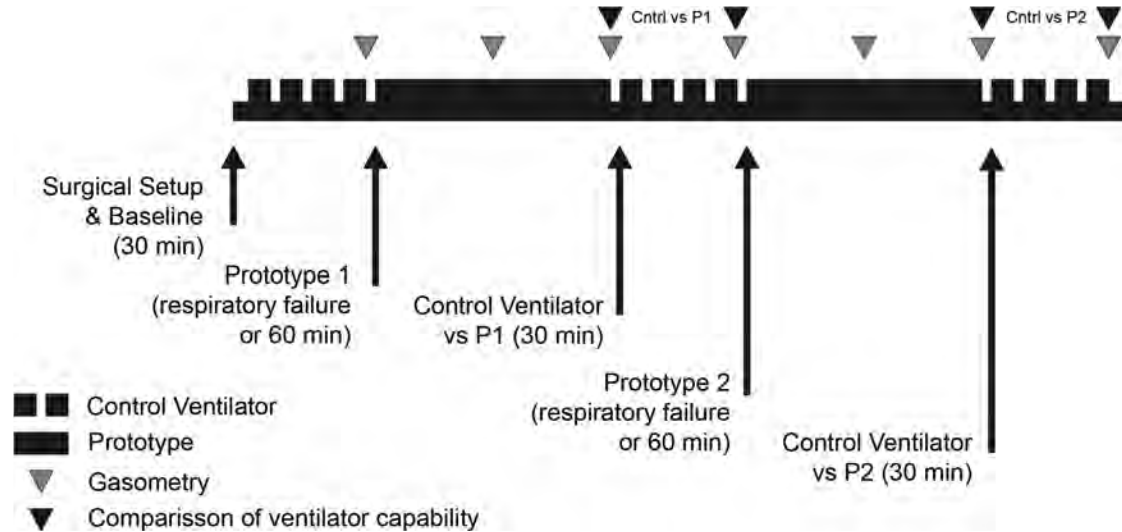
Phase 1: Functional Tests with mannequins



Phase 2: Preclinical Evaluation (healthy animals)



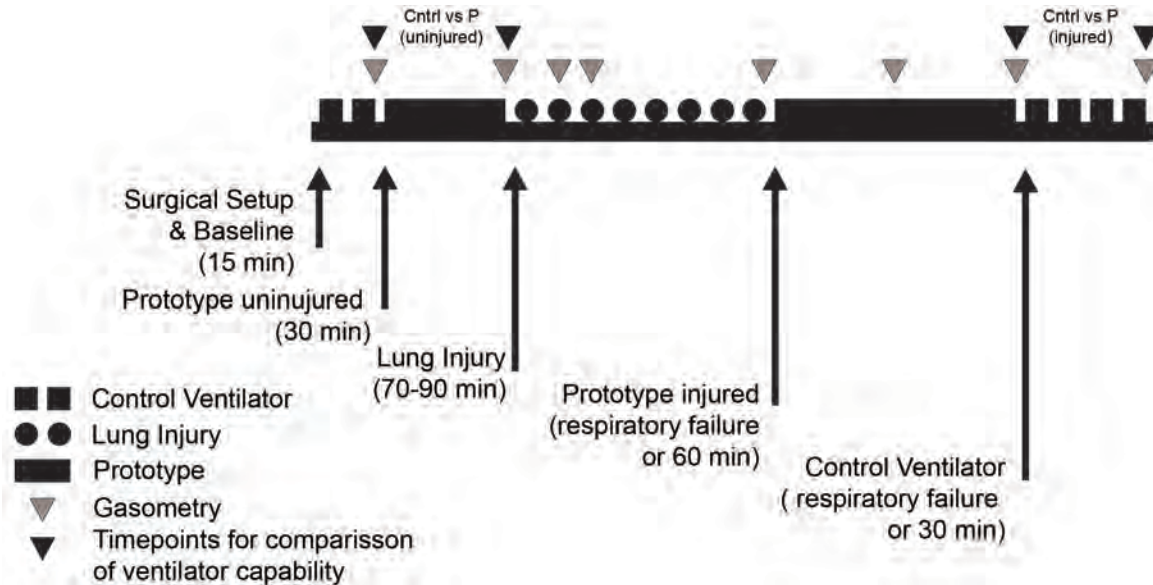
- Porcine model (n=6)
- Anesthesia: bolus injection and IV
- Evaluate ventilation after 60 min, 2 devices per animal (healthy)
- Comparison against final control ventilator
- Effectivity criteria: blood gasometry (i.e., pO_2 , pCO_2 , pO_2/FiO_2)



Phase 3: Preclinical Evaluation (lung injury model)



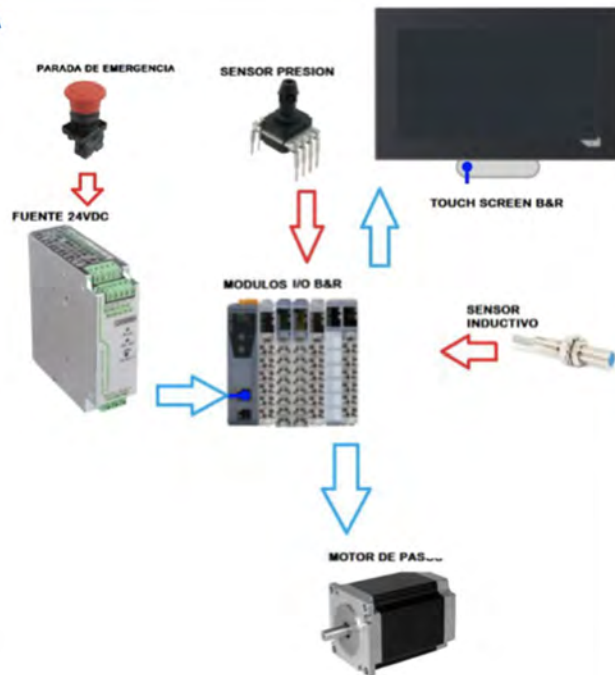
- Porcine model (n=6)
- Anesthesia: bolus injection and IV
- Lung injury: saline lavages (37C), every 10 min until $pO_2 < 90$ mmHg for 60 min
- Rescue animal for 60 min
- Comparison against final control ventilator
- Effectivity criteria: blood gasometry (i.e., pO_2 , pCO_2 , pO_2/FiO_2)



Team PSED-AMBU-PLC (1)



A



B



Team PSED-AMBU-PLC (2)



Team PSED-AMBU-PLC (3)

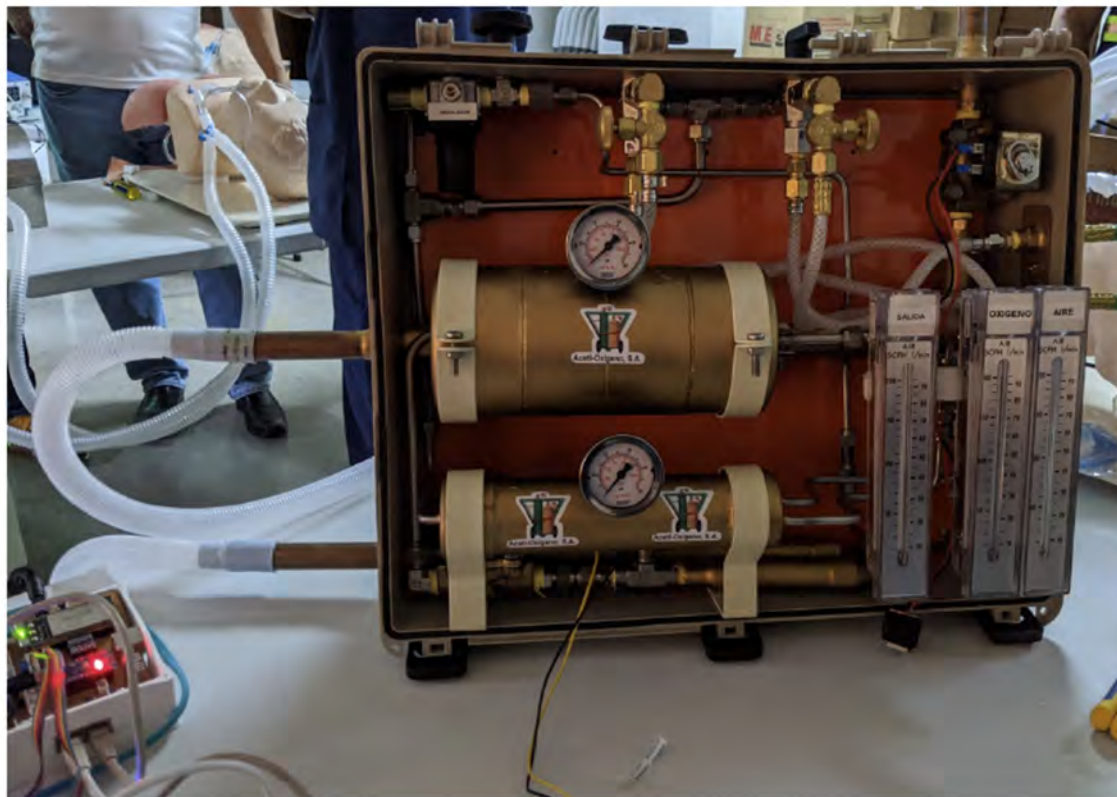
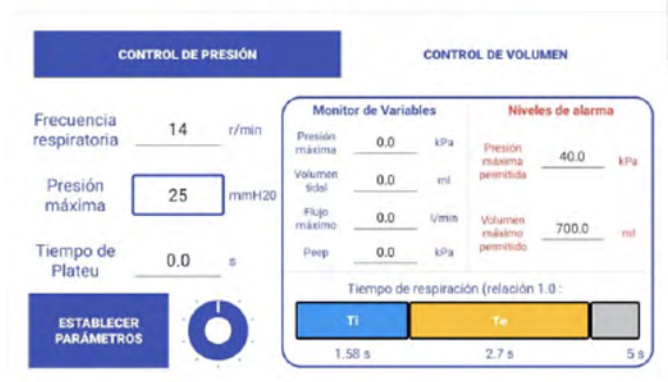


Team UTP-100P



Ventiladores por Panamá

Modelo de Flujo Continuo



Team UTP-100P (2)



Lessons Learned / Future Challenges

- Lessons:
 - Panama has talented human resource to help solve major health, technological problems
 - Ambitious projects can be achieved with limited funding, with the support of committed, interdisciplinary professionals, institutions
 - Collaborative approach (no choosing “winners”)
 - Learn, find expertise in local regulations, international accreditation
 - Involve health authorities early, invite them to take ownership of initiative
 - Tread the public communication path carefully: do not oversell the project or criticize authorities

Agradecimientos



**Fundación
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¿Questions?

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