WATER-LESS ICU: ELIMINATING WATERBORNE INFECTION THROUGH INFRASTRUCTURE REDESIGN AND WORKFLOW INNOVATION

Low Jia Ming, Wang Xia, Lee Soke Yee, Yvonne Ng Peng Mei, Krishnamoorthy Niduvaje, Agnihotri Biswas, Zubair Amin
DEPARTMENT OF NEONATOLOGY, KHOO TECK PUAT – NATIONAL UNIVERSITY CHILDREN'S MEDICAL INSTITUTE, NATIONAL UNIVERSITY HOSPITAL, SINGAPORE

National University Hospital
A member of the NUHS

INTRODUCTION

Late-onset sepsis (LOS) in very low birth weight (VLBW) infants persisted despite strict hygiene protocols. Surveillance identified water-based sources sink traps and faucet aerators as persistent reservoirs of multidrug-resistant bacteria. A root cause analysis confirmed these water fixtures as critical transmission points. Inspired by international models of "water-less ICUs," which showed success in reducing multidrug resistant organism transmission, we reimagined our infection control strategy around eliminating water infrastructure dependencies.

WATER-LESS ICU?

Critical care setting where tap water sources are eliminated and replaced with sterile, water-free alternatives.

Phase 1: Risk Assessment

(2021 - 2022)

- Sinks linked to infection sources
- Findings supported tap water removal

Phase 2: Planning & Redesign

(2022 - 2023)

- Removed/closed bedside sinks
- Introduced sterile wipes, UV sterilizers, alcohol rubs

Phase 3: Implementation

(2024)

- Developed water-free protocols
- Staff trained and families oriented

Phase 4: Evaluation

(2024 - Present)

- Tracked sepsis rates and bioburden
- Collected staff feedback

REASONS FOR WATER-LESS ICU IMPLEMENTATION

Increased incidence of Late-onset Sepsis (LOS)

Contaminated Sinks and Plumbing

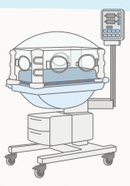
Sinks redesign into appreciation card display area

Presences of tap borne pathogens

Ineffectiveness of traditional cleaning methods

Need for sustainable infection control model

DISTRIBUTION OF WATER-LESS ICU INTERVENTIONS



Use of wipes /irrigated bottled water to replace routine baths

Milk Preparation using electric milk warmers and use of UV sterilizers

Sinks redesign into appreciation card display area

Wash Basin removal from patient areas

Incubator & surroundings wiped down once per shift

Monthly Surveillance

RESULTS

Environmental Safety

✓ Sink contamination dropped from 69.4% → near-zero
✓ Bioburden reduced 11-fold (16.34 → 1.49 CFU/mL; p = 0.0094)

Clinical Impact

✓LOS in VLBW infants 14.8% in 2014 – 2016 to 3.8 –6.6% in 2021 – 2024.

Systemic Gains

✓Reduced plumbing costs
✓100% compliance from NICU families
✓ 90.1% staff supported the waterless model

CONCLUSION

- Markedly reduce waterborne infection risks through redesign
- Achieved significant reductions in sepsis and environmental bioburden
- Scalable and sustainable across diverse healthcare settings
- Sets a new standard for infection control in neonatal intensive care

We thank Tamanna Ferdous for creation and design of the poster