Designing a Modern ICU
From a Doctor’s Perspective

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Disclosure
Agenda

- History of ICU Development
- Modern ICU Design
- Healing Environment
- ICU Informatics & Big Data
  Interoperability
What is modern

- Of or relating to present and recent time; not ancient or remote

- Characteristic of present and recent time; contemporary; not antiquated or obsolete

- A modern ICU design must be **flexible** enough to **accommodate** changing care practices and advances in technology over the unit’s lifespan
The first intensive care unit in the world

The first intensive care unit in the world: Copenhagen 1953
Poliomyelitis in 1950s
Kwong Wah Hospital
The ICU Design Team
Doctor’s Perspective
Location of ICU

- Within the “Hot Zone” of hospital

- Proximity to Operation Theatre, Imaging Departments, Accident and Emergency Department, CCU, HDUs

- Access to helicopter
ICU Design

- Patient Care Zone – Patient Room
- Clinical Support Zone
- Unit Support Zone
- Family Support Zone

- ICU Patient Rooms
- Central Areas
- Universal Support Services
- ICU Informatics
ICU Design

- ICU Patient Rooms
- Central Areas
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- ICU Informatics
Patient Room

- Core of the ICU patient, visitor, and staff experiences

- Single- vs. Multi-Bed Rooms
Single- vs. Multi-Bed Rooms

- Physical space
- Nursing staff
Single-Bed Room

- Better patient comfort
- Better patient privacy (doors, e-glass)
- Better Infection control
- Better patient and family satisfaction
- Better HEALING ENVIRONMENT
Modern ICU design

- Provide sophisticated life support therapy and HEALING ENVIRONMENT

- Help to reduce medical errors, improve patient outcomes, reduce length of stay, and increase social support for patients, and can play a role in reducing cost
Healing Environment

- Design that produces improvements in physical or psychological states of patients, staff, physicians and visitors
Critical care physicians are more likely to experience burn out than their colleagues and are least happy outside of work\(^8\)
Elements of a Healing Environment

- Natural light, minimize glare, views of nature, adjustable lighting levels
- Materials and finishes that reduce noise levels
- Stress-reducing furnishings and décor
- Thoughtful provision for the comforts of patients, families, and staff, horizontal surfaces for photos, greeting cards……
- Floor plans, equipment, temperature control and ergonomic features
- Support infection control
- Enhancing the efficiency and effectiveness of patient care and minimizing workplace injury
Lighting

- Patient exposed to increased intensity of natural sunlight have been shown to experience less perceived stress, use less analgesics, and have improved sleep qualities and quantity

- Bright light, both natural and artificial, reduce depression in patients

- General illumination should feature adjustable lighting level
Delirium in ICU

im just so confused
Room Décor

- Pleasant surroundings for patient, visitors and staff promote increased comfort, and could potentially improve outcomes
- Color scheme can affect mood and stress level
- Scenes of nature in *greens* and *blues* have been shown to decrease stress levels
- Pictures and artwork
ICU noise
Elements of a Healing Environment

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Lifting Devices

- Several studies have found that work-related injuries have become a major problem in intensive care units, and lifting is one of the most common cause of injury

- Ceiling mounted mechanical lift device or mobile lift

- Early mobilization of patients
ICU Design

- ICU Patient Rooms
- Central Areas
- Universal Support Services
- ICU Informatics
Central Areas

- Nurse station
- Pneumatic tube station
- Automated medication dispensing unit
- POCT
- Medical devices storage room
- Procedure room
- Corridors
- Administrative offices
- Duty room/staff lounge/conference room
- Family lounge
Nurse Station
Decentralized Nurse Station and Mobile Nurse Station
Staff Lounge / Family Lounge
ICU Design

- ICU Patient Rooms
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- Universal Support Services
- ICU Informatics
Universal support services

- Infection prevention (air exchanges, airborne infection isolation, alcohol gel dispensers)
- Finishing and flooring (durable, water-resistant at appropriate sites)
- Staff communications (phones, overhead speakers, nurse-call station, bidirectional transmitters)
- Signage
- Security
- Fire and safety
ICU Design

- ICU Patient Rooms
- Central Areas
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- ICU Informatics
ICU Informatics

- Integrates the patient in the ICU with all aspects of care
- Displays data in a variety of formats
- Uses data proactively to enhance patient safety
ICU Informatics & Big Data

- **Medical Devices are Informatics Platforms**
  Integrated with ICU Middlewares

- **Interoperability:**
  Data generated by one device can be accessed and used by another
ICU Informatics: Interoperability

- Data generated by one device or system can be meaningfully accessed and used by another → Data sharing
Tele-ICU
Tele-ICU
Tele-ICU
Conclusion

- A modern ICU design must be flexible enough to accommodate changing care practices and advances in technology over the unit’s lifespan

- Modern ICUs provide sophisticated life support therapy and HEALING ENVIRONMENT

- Interoperability: Data generated by one device or system can be meaningfully accessed and used by another

- Tele-ICU