

The Paediatric Intensive Care Unit (PICU)
at the B.C. Children's Hospital
Renovation experiences
The Infection Control Perspective

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Content

- Background
- Demonstrate the need
- Site options
- "Living through" the renos
- Lessons learned

B.C. Children's Hospital opened in 1982



Initial footprint under-dimensioned
Residential neighbourhood (height, parking..)



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Pediatric Critical Care B.C. Children's and Women's Hospital

- Neonatal Intensive Care Unit (NICU)
- Built in 1982
- Renovated in 2000
- 40 beds
- Pediatric Intensive Care Unit (PICU)
- Built in 1982
- Renovated in 2007-08
- 22 beds

MRSA

Enterobacter

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PICU

- Appropriately located adjacent to ER, OR and radiology



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PICU

- Who are the patients?
- Why do they come?
- Where do they come from?
- What is their outcome?

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Most complex pediatric patients in B.C.

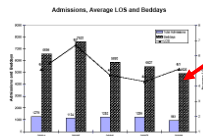
- Sicker patients + more advanced technology= more space required

PICU activities

- Trauma
- Cardiac patients
 - Postcardiotomy bypass (open heart)
 - Post cardiothoracic patients (closed heart)
 - Congenital heart (no surgical)
- Ventilation and vasoactive support
- Plasmaphoresis
- Peritoneal dialysis
- Extracorporeal life support
- Extracorporeal renal support
- Respiratory support & monitoring
- Pharmacological delivery devices

British Columbia Children's Hospital Pediatric Intensive Care Unit 2008

FIVE YEAR CENSUS HISTORY



2008
Total admissions: 961
Total # bed days: 4926
Total # of deaths: 36

In 2008 extraordinary staffing challenges, surgical cancellations & other access issues despite an apparent decrease in census

PICU faced increasing demands for a broader range of patients

- Overall acuity increased
- Ability of other units to provide care decreased
- Poor design and lack of space meant that PICU could not handle new demands safely
- Major infection control concerns
- These challenges no longer be met with minor renovations

Expansion and renovation plans began in 2004

- Infection Control concern primary driver
 - Inadequate isolation rooms
 - Small clean and dirty utility rooms
 - Inadequate storage for used and unused respiratory equipment

Specific Triggers

- Post SARS
- Post South American Hantaan virus
- Cluster of enterobacter bacteremias tipped the scale



Renovation considerations PICU “Engineering controls”

- Proper space around beds
- Sinks in convenient places
- Separate sinks for cleaning equipment
- Isolation rooms with anterooms
- Functional patterns
- Traffic patterns
- Nursing staff may prefer a more open layout for visibility, openness and easy-access
- Infection control prefers closed single rooms – dedicated sinks etc.

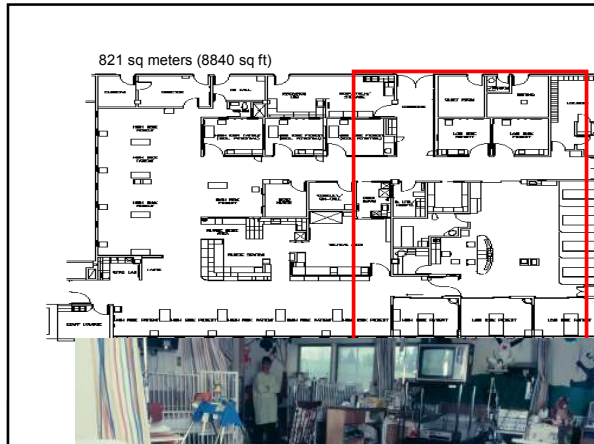
PICU General considerations

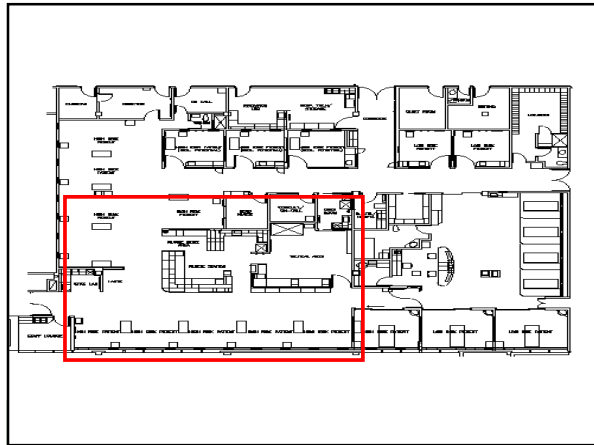
- Family participation
- Stressful situations
- Long hours
- Staff and family must have accomodation in close proximity
- Privacy, atmosphere aesthetics

“Each bed shall have 200 sqf of clear floor with a minimum headwall width of 13 feet per bed exclusive of anterooms, vestibules, toilet rooms, closets, lockers, wardrobes and/ or alcoves”

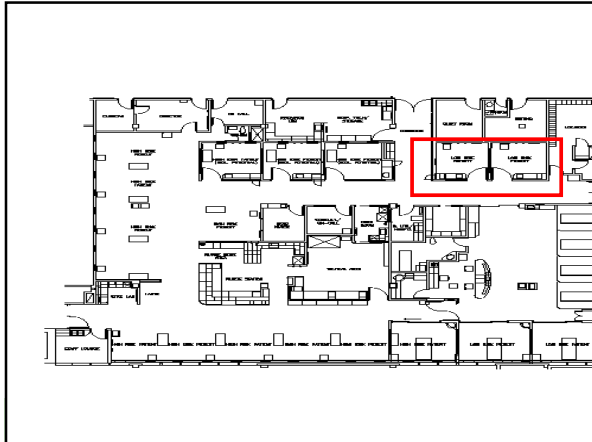
From: Guidelines for Design and Construction of Health Care Facilities, The American Institute of Architects













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PICU staff & the Infection Control team had identified longstanding problems *November 2000*

- **Lack of storage space for:**
 - Supplies
 - Equipment
 - Personal items
 - Respiratory therapist equipment: Poor separation of clean and dirty equipment, cluttered shelving and gas bottle storage areas.
- **Clean utility room:** Cardboard boxes on the floor – cleaners have to move them to clean properly
- **Dirty utility room:** The bedpan sanitizer was decrepit (recently blocked leading to a flood on the floor) *A better way of disseminating gram negative enterics would be hard to invent.*
- **Isolation rooms:** No anterooms
- **Lack of:**
 - Staff washrooms
 - Sufficient parent facilities
 - Sleeping rooms for the doctors on call
 - Office space

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The "Fable" PICU

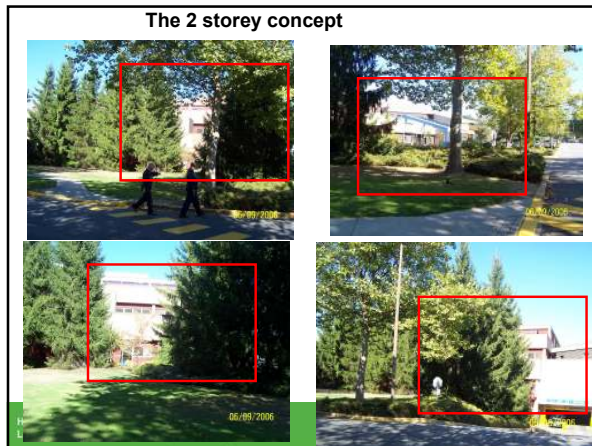
- Isolation room increase from 8 to 12 (4/12 with anterooms)
- Sinks inside and outside rooms - full counter sink, backsplash
- Two good sized ECMO rooms
- Space to set up ECMO equipment
- Nursing station with unit clerk at the entrance to control flow, handwashing etc.
- Good flow for clean and dirty utility items
- Sleeping rooms for on call staff
- Capacity to cohort during respiratory season
- Respiratory service – separate room for cleaning/sterilization
- Clean/dirty utility rooms with adequate space
- Bed pan decontaminator (Tornado)
- Adequate storage for supplies
- Lockers, sleeping rooms, parents/visitors space, staff lounge

Demonstrated need

- Interior renovations
- Expansion

Four options were considered by the planning group

1. One storey expansion to accommodate RT equipment storage, offices, locker rooms
2. Expanding unit into other parts of the hospital
3. Expansion into parking garage
4. Two storey expansion



Spanner in the works

- New hospital was being planned
- PICU physicians and Infection Control did not want to be “bumped” from the renovation cue
- Compromise!
- Option 1 won

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Definite economic barrier

The illustration shows a man in a suit sitting at a typewriter. To his left is a large, glowing blue dollar sign (\$) inside a white circle, which is topped with a crown. A black line connects the typewriter to the dollar sign, suggesting a direct link between the work being done and the economic barrier.

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Option one – budgeted to approximately \$4,000,000

821 sq meters (8840 sq ft)

279 sq meters (3002 sq ft)

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Renovation experience

- PICU had to remain open
- Renovations staged
- One area at a time with decanting of patients etc. from other areas

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PICU had to stay open presented many challenges

- Ventilation
- Decanting of patients
- Hording

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Unforeseen problems



Sink installation - Water valve shut off

- Extended to radiology, post anesthetic recovery, laboratory and one ward
- Enough residual pressure to keep running for 1.5 hours
- Sinks ran out of water and toilets began to plug
- A plumbing supervisor was called
- Hospital workers were working over night to flush all the water lines, unplug toilets and fix leaked that had developed



New isolation rooms

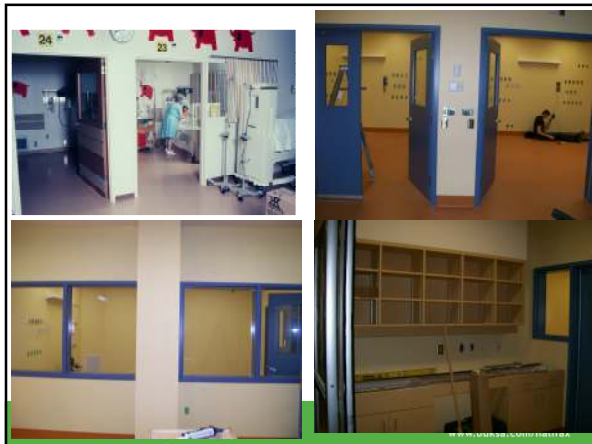
- Inspectors – delay
- Occupancy permit delay







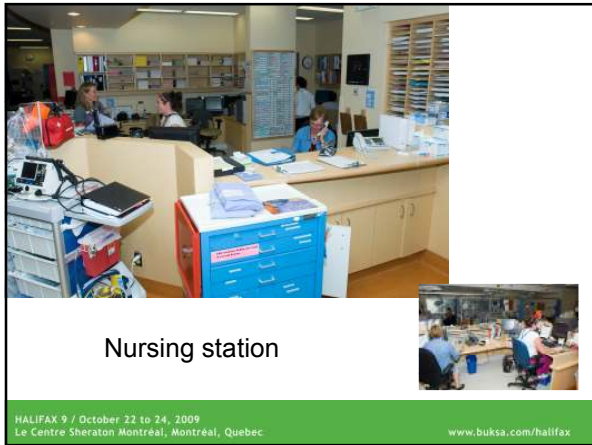






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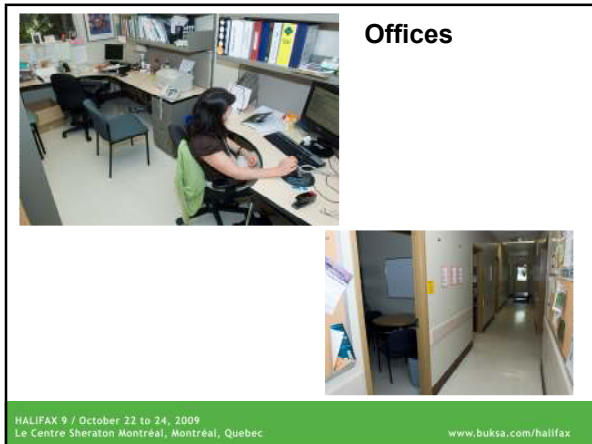
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Nursing station

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Offices

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Do we have a new hospital? 2009

- No



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Could we measure decrease of HAI after renovations?



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Do PICU renovations decrease HAI rates?

- Difficult to measure
- Paucity of studies
- Some well designed studies found no infection rate difference after renovations (*Maki DG et al N Engl J Med 1982*)
- Wound infection rate studies have yielded conflicting results (*Huebner J et al Intensive Care Med. 1989*)
- Changing entire location to a newly constructed and geographically relocated area with optimal infection control measures may result in a decrease of HAI (*Fahed et al. Crit Care & Shock 10(1):20-25.2007*)

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If more beds and space had been added upfront (Option 4)...

<p>Increase</p> <ul style="list-style-type: none"> • Operating costs • Staff requirement • Staff retention • Patient safety • Staff safety • Preparedness for surge 	<p>Reduction</p> <ul style="list-style-type: none"> • Undesirable patient outcomes • Hospital acquired infections • Hospital days/patient • Stress level for staff and parents • Workforce injuries • Litigation
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Budget lessons learned

<ul style="list-style-type: none"> • One time capital investment versus ongoing operating costs 	<ul style="list-style-type: none"> • Costs saved versus lives saved
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Silver lining

- New hospital is now being planned and we have a better understanding of PICU-needs
- Better communication between planners, PICU staff, administration and infection control
- Will aim to identify measurable changes prior to new construction



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