

ARCH 12: ARCHITECTURE / RESEARCH / CARE / HEALTH
Gothenburg -- November 13-14, 2012

An international perspective:

**How Scandinavia can benefit from
research on healthcare environments**

Roger Ulrich, PhD, EDAC

Center for Healthcare Building Research
Chalmers University of Technology

and

Department of Architecture, Design and Media Technology
Aalborg University

Overview: An international perspective

- on healthcare construction activity
- changes in building procurement methods
- changing expectations and needs of healthcare clients
- challenges for Scandinavian architecture firms competing for projects internationally
- growing role of healthcare environments
research internationally in all of the above
- implications for Nordic countries

X = very little healthcare construction

X = declining construction

More demand for new healthcare construction

U.K. PFI healthcare program has ended

Univ. EBD program

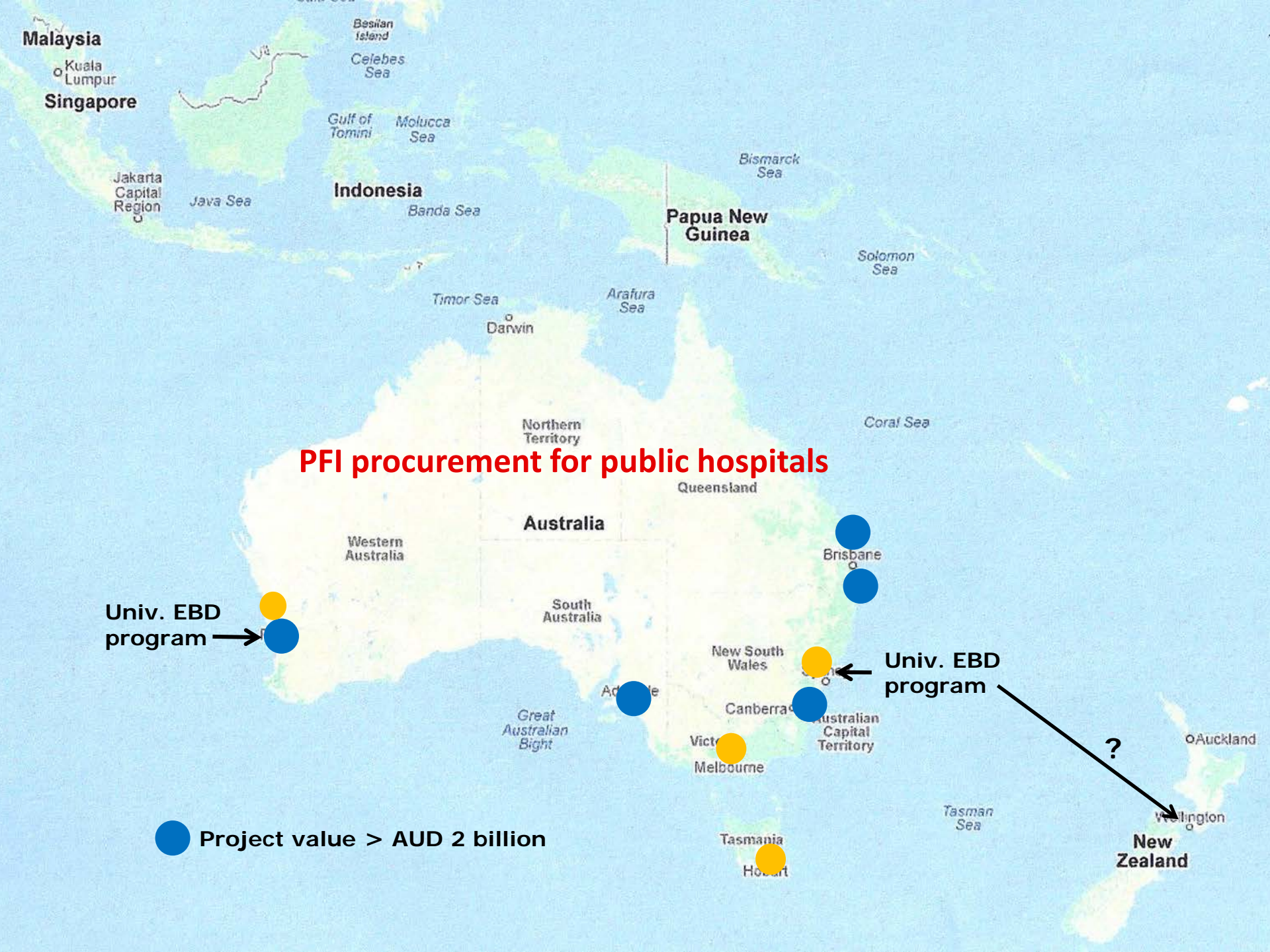


Much new healthcare construction in Canada

PFI building procurement

- EBD research affects all briefs
- Firms must have EBD knowledge to bid for projects





Massive wave of construction -- thousands of new hospitals will be created in next few years

- Foreign architecture firms receive very low fee rates (2-3%)
- But foreign firms usually produce only preliminary designs + site planning
- Production of final designs, construction drawings, other work sent “in shore” to design shops
- EBD research knowledge is beginning to impact a few projects



- Journal of China Hospital Architecture and Equipment (JCHAE) will publish special issue on EBD research
- Seminars on EBD for senior healthcare civil servants and managers of large hospitals

International perspective on new healthcare construction:

- Extreme variation between countries in healthcare construction activity
- In N. America and Europe (except Scandinavia) too many design firms are chasing too few new projects
- The combination of 1) intense competition for projects, 2) **new types of building procurement methods**, and 3) more demanding clients, is driving down architecture fees and putting great stress on the traditional business model of architecture

International perspective on new healthcare construction -- continued

- Increasingly, design firms in Europe and North America must look for new healthcare projects in
 - ◆ Middle East
 - ◆ Canada
 - ◆ Australia } **PFI procurement**
 - ◆ Asia, especially China
- To compete internationally, architecture firms are becoming larger and developing specialized expertise in healthcare. Increasingly this includes in-depth expertise in **evidence-based design**

EBD influence in different world regions

| Region | Design briefs | Clients informed | Design firms informed |
|---------------|---------------|------------------|-----------------------|
| W. Europe | increasing | increasing | some yes, most no |
| Canada | all | increasing | increasing |
| United States | all | nearly all | all |
| Australia | all | increasing | some yes |
| Persian Gulf | most | mostly no | mixed |
| China | a few | no | no |

What is PFI or PPP?

- PFI = Private finance initiative
- Procurement method for buildings that uses *private sector* funding and debt, and *private sector* construction and other services, to create and maintain a *public* facility
- **PFI is magnetically attractive to politicians** because it pushes costs off the “current books,” and passes financial responsibility to future politicians and taxpayers – usually according to a 30-year mortgage

What is PFI? -- continued

- PFI hospitals are created by a “consortium” consisting of a bank + construction firm + design firms + facility management firm (usually)
- In theory, PFI transfers risk from the public to private sector. (This is controversial.)
- What are the main **risks** for the private sector?
 - ◆ Meet tight schedule for design and construction – or pay high penalty fees
 - ◆ Maintain the hospital for 30 years
 - ◆ Provide facility management services

**Costs of delivering
healthcare services**

Risk of delivering lower quality care
at higher cost resulting from poorly
designed hospital is passed to the
healthcare system and taxpayer

**Construction
costs**

**Design &
construction**

**RISK: Must
meet tight
deadlines**

**Maintenance and facility management
(usually 30 years)**

**RISK: Materials, mechanical systems
may fail at unexpectedly high rates**

Obstacles to quality design in PFI method

- Design **innovation increases risk** for private consortium – and strong pressure to use conventional “proven” design approaches
- Much private sector risk in meeting construction dates creates strong pressure to reduce communication /participation between client and architect
- Lack of transparency regarding project information is characteristic of PFI projects internationally. Private sector confidentiality regulations apply. Little external information made available about project design.

How a quality PFI hospital can be created

- First, essential to produce a design brief or program of requirements of the highest quality (Elf et al. 2012). This applies for any procurement method , but especially PFI. Weak design briefs or specifications block the best intentions of the private sector, including the architect
 - ◆ **EBD knowledge is critical for developing quality briefs**
- Second, essential that the **client** is well-informed about healthcare research knowledge and design concepts
- PFI briefs in Australia, Canada, and UK (in later projects) have become infused with EBD requirements, and typically mandate use of “the latest EBD knowledge and design principles”

**PFI "healing garden"
resulting from a bad
design brief**



**PFI accessible garden
resulting from good
design brief + client,
both well-informed by
EBD knowledge**



Newly completed hospital in W. Europe, 2005

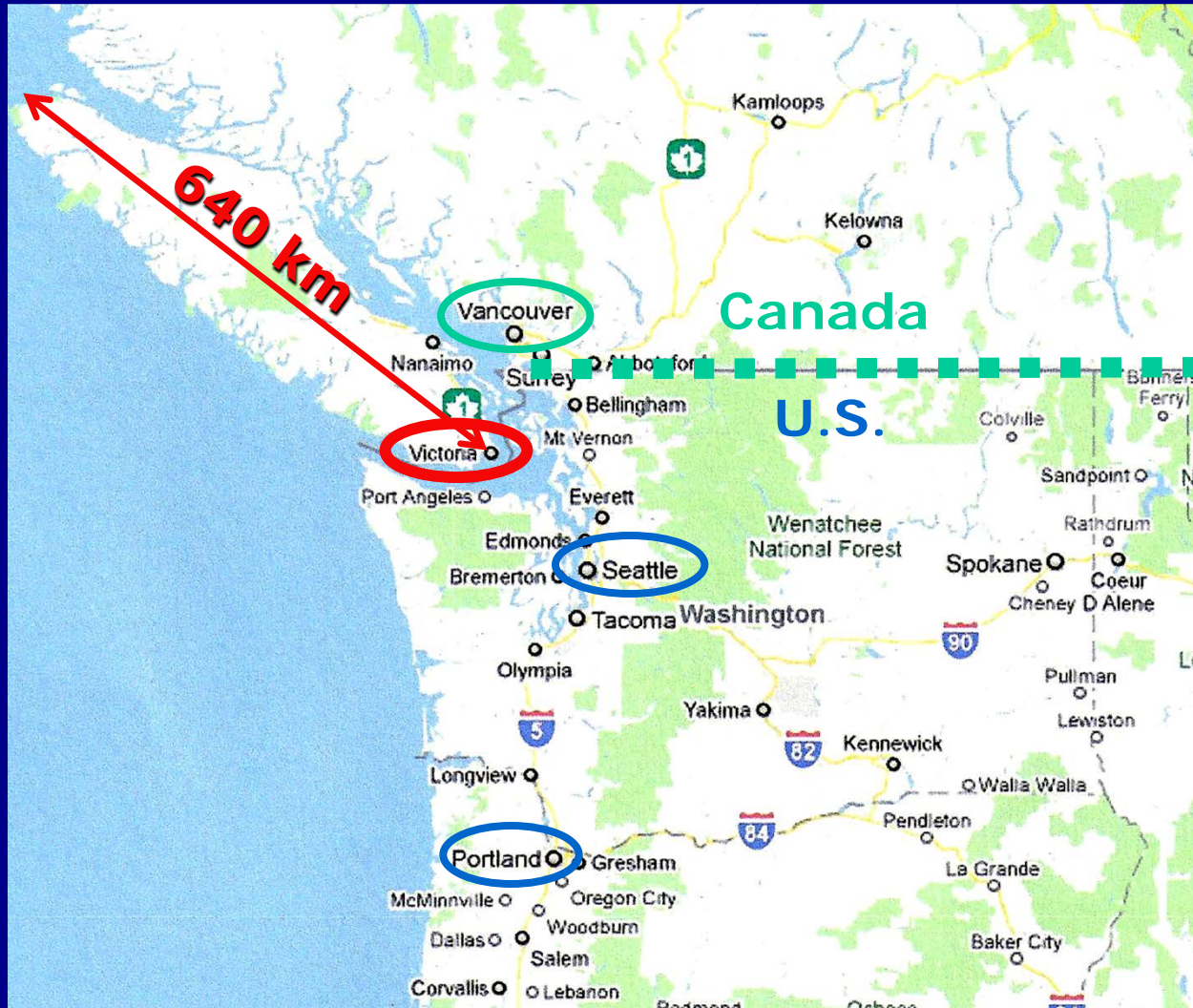
- Multi-bed room & shared toilet
- One handwash sink near hall door
- No visible alcohol hand rub dispensers
- Patients not visible to staff from corridor or nurse station
- Air quality/ventilation?
- High noise, poor acoustics
- Lack of privacy, patient confidentiality
- One chair per bed for family
- Inefficient ward layout for nurse work



Bad brief + client not informed about research + architect lacking EBD knowledge

Case study: An innovative PFI Hospital

Royal Jubilee Hospital -- Victoria, British Columbia, Canada



Royal Jubilee Hospital -- Victoria, Canada

Top Design Issues

- **Patient Safety**

Reduce falls

Reduce infections

Reduce patient transports

- **Staff Safety**

Reduce lifting injuries

- **Staff efficiency & satisfaction**

Background information

- Royal Jubilee patients have **oldest average age** in Canada
- Patients increasingly **sick**
- Patients increasingly **overweight**
- Aging nurses (average age = 49)

- Combination of older + sicker + overweight patients →
 - ◆ Very high number of patient **falls**
 - ◆ Very high rate of staff **lifting injuries**

Preventing Falls: Research

Benchmark Hospitals

Research Literature

Firm's Studies & Experience

- Bedrails *not* effective
- Design for good visual access to patients important
- Headwall-mounted door to toilet may reduce falls
- Many falls occur during toileting
- *Bundles* of design factors can be effective (non-slip flooring, lighting, handrails)
- Family presence
- Wide doors to permit dual assistance
- Electronic sensors promising

Royal Jubilee Hospital

Victoria, Canada

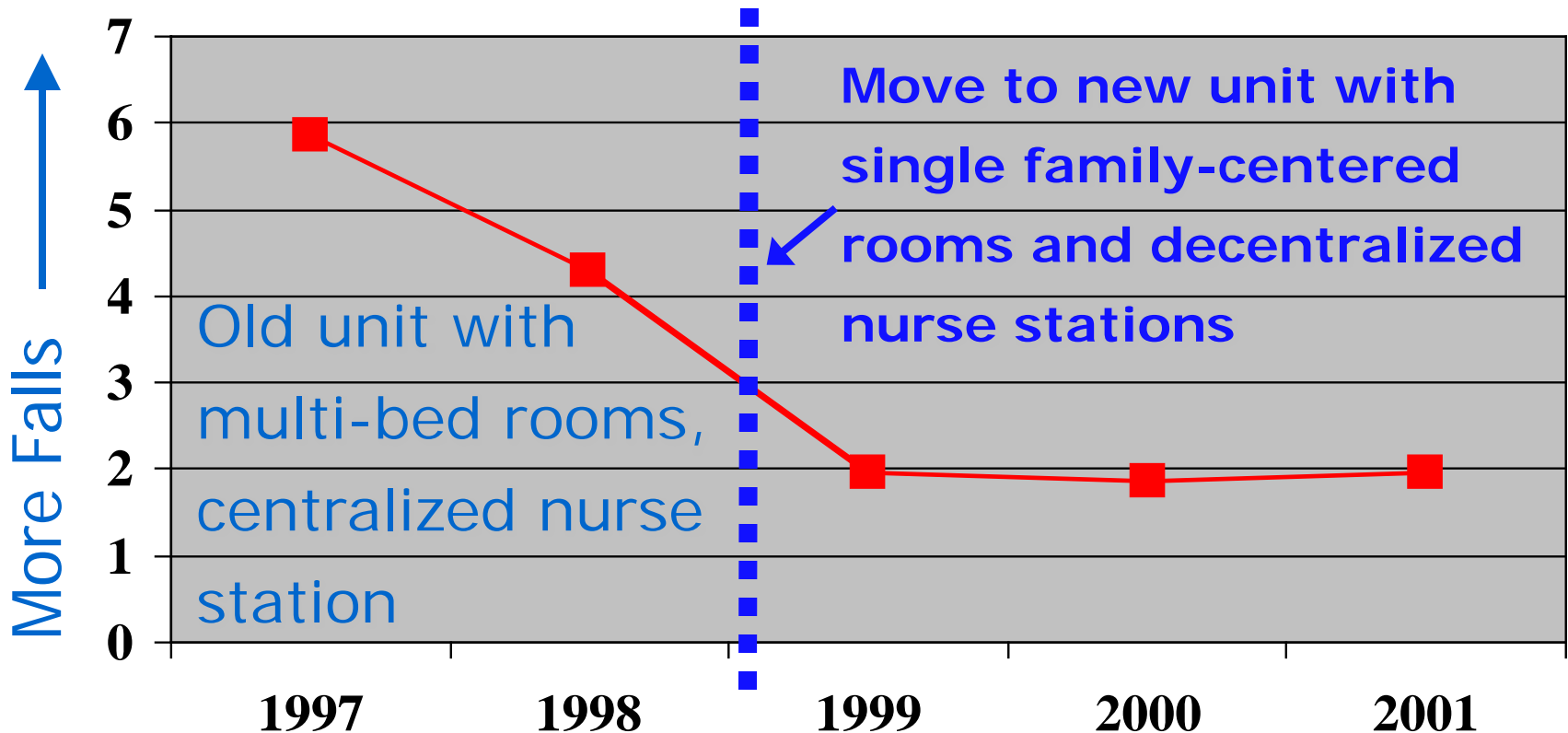
Decentralized nurse stations designed for visual access + family-centered **single rooms** improve assistance for patients, thereby reducing **falls**



Acuity-Adaptable, Family Centered CCU
Methodist Hospital, Indianapolis

BSA LifeStructures

Methodist Hospital Study: Patient Falls Index (per 100 patient days)



Source: A. Hendrich (2004). In *Keeping Patients Safe: Transforming the Work Environment of Nurses*. *Quality Chasm Series*, Institute of Medicine.

Preventing Patient Falls: Interpretation of Evidence

- Provide good visibility of patients
- Nurses located close to patients
- Bundles of design measures needed (hand rails, non-slip flooring)
- Family presence reduces falls
- Rethink how patient is toileted

Create Evidence-Based Design Concepts:

- Decentralized nurse stations
- Room design
- Locate door to toilet on headwall
- Ceiling mounted lift to take patient from bed to toilet

Royal Jubilee Hospital
Victoria, Canada

Hypothesis

- Fewer falls!

Measures

- Standard reports of falls
- Cost of falls
- Litigation

Royal Jubilee Hospital

Staff Lifting Injuries:

Research

Research Literature

Benchmark Hospitals

Firm's Studies & Experience

Most staff injuries occur when lifting patients

- Ceiling mounted lifts or hoists are known to prevent most injuries. But portable lifts are not effective.
- Nurses' average age = 49 years at Royal Jubilee

Research has found that 18% - 30% of staff injuries occur while toileting patients

Patient room with bed to toilet ceiling lift

Royal Jubilee Hospital, Victoria, Canada



Continuous hand rail from bedside to room with toilet



ER NOTICE
ATTEND TO ENDS
REGARD LIFT WITH
PUSHED UP

USE NOTICE
CHECK THE MANUAL
FOR THE LIFTING
INSTRUCTIONS

WYERLY GLEN

Pocket
Mask





Design Hypothesis 1

- Fewer patient falls

Design Hypothesis 2

- Fewer staff lifting injuries



International trends in healthcare systems

- **Strong pressures to reduce costs yet increase healthcare quality**
- **Many countries adopting “payment according to quality” policies for paying hospitals/providers**
- **Centralization of high acuity complex procedures and specialties in small number of “super” hospitals**
- **Systems are identifying and standardizing high performance care processes that cut costs**
- **Hospital networks or systems in U.S. and other countries are becoming bigger, more integrated, more standardized**

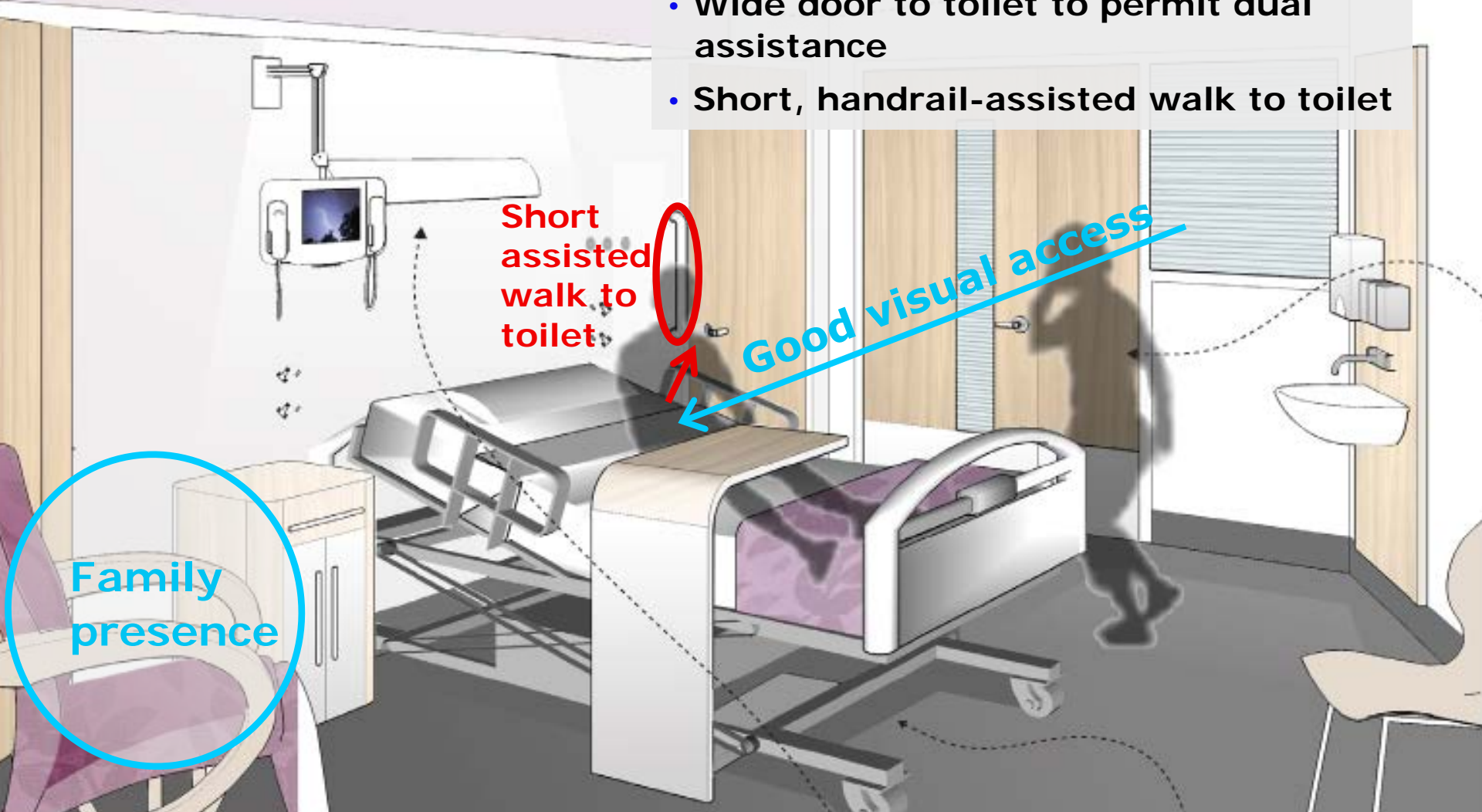
Implications of international trends for design firms

- New, different, more demanding client environment
- Very difficult for architecture firms to establish long-term relationships with clients. Each new bid will be intensely competitive.
- Client decisions will be made on the basis of impartial (cold-blooded) performance and **value-added** criteria, not long-term personal relationships
- Architects increasingly required to demonstrate the **value added** by firm's design services to the client

Preventing Falls

EBD fall reduction measures in a new UK hospital design:

- Localized nurses with good visual access to patient
- Family presence
- Wide door to toilet to permit dual assistance
- Short, handrail-assisted walk to toilet



Short
assisted
walk to
toilet

Good visual access

Family
presence

Where does research on healthcare environments fit into this picture?

- Research is central to evaluating **value added** with respect to improved outcomes, safety, and cost effectiveness
- Research is critical for clients to gain new knowledge, and produce high quality design briefs

| IMPROVED OUTCOMES | Design measures identified by research as fostering the outcome improvements | Judgment of % improvement in outcomes |
|--|--|---|
| <i>Reduced hospital-acquired infections</i> | Single rooms with private bathrooms; number and location of sinks and hand rub dispensers promote higher hand hygiene; very good air quality (changes, filtration, airflow direction control); single rooms can be more thoroughly cleaned; fewer transfers to expose patients and spread contamination; risk of lawsuits reduced over long-term. | Design interventions help reduce hospital-acquired infections by 35%¹ |
| <i>Reduced patient falls</i> | Single rooms designed to provide staff very good visual access to patients; decentralized nurse stations place nurses closer to patients; ceiling-mounted lifts reduce falls risk at bedside, en route to bathroom, and during toileting; single rooms support extended family visits; wide door to bathroom; larger bathroom; bathroom located on headwall makes possible shorter handrail-assisted walk to toilet. | Design measures help reduce falls by 30%² |
| <i>Reduced use of pain drugs</i> | Nature distractions, including window views, art, VR or digital images; higher daylight exposure provided by building siting/orientation and larger patient windows; reduced noise and other stressors. | Nature distractions, increased daylight, and reduced noise help reduce pain drug intake by 20%³ |
| <i>Reduced nurse injuries</i> | Ceiling-mounted lifts that extend from beds into bathrooms and over toilets; wide door access to bathrooms; larger bathrooms. | Design measures help reduce patient handling injuries by 60%⁴ |

Examples of studies that support the judgments regarding percentage improvements in outcomes linked to design measures. Many additional relevant studies are cited in the research surveyed in earlier sections.

1. A recent study in a Canadian hospital found that single rooms in an ICU reduced *C. difficile* by 43%, MRSA by 46%, and other infections by 51% (Teltsch et al., 2011). Moore et al. (2008) found that having one roommate with MRSA increased MRSA risk by 20 fold. U.S. studies have reported, for example, that exposure to one roommate with *C. difficile* increases risk for acquiring the infection by 73% (McFarland et al., 1989) and 85% (Chang and Nelson, 2000). Studies by Pettit et al. (2000) and other investigators have shown that bedside placement of alcohol hand rub dispensers increases hand hygiene compliance by 20% or more. Research by Lucado et al., (2010) estimated the average cost of a hospital-acquired infection in the U.S. was \$43,000.
2. Hendrich and colleagues (2004) found that the combination of decentralized nurse stations with good visual access to patients, large single rooms that support family presence, and wide doorway access to bathrooms reduced falls by 77%. Roudsari and colleagues (2005) estimated that the average cost of a hospital fall is \$17,500.
3. Walch et al. (2005) found that higher daylight exposure reduced intake of potent analgesics by 22% in postsurgery patients, and reduced their pain drug costs by 21%. Ulrich (1984) reported that window views of nature reduced need for strong narcotic pain doses by 60%, and lessened intake of moderate strength narcotic analgesics by 52%.
4. Studies have found that ceiling-mounted lifts reduce nurse lifting injuries by 60% – 80%, and pay back the additional investment cost in approximately 2.5 years (Joseph and Fritz, 2006; Chhokar et al., 2005; Tiesman et al., 2003). A U.S. study has estimated the average cost of each patient handling injury to be \$26,000 (Hunter et al., 2010).

Where does research on healthcare environments fit into this picture?

- Research is central to creating healthcare buildings that respond effectively to challenges facing Nordic countries – such as aging sicker patients, chronic diseases, the serious threat of antibiotic resistance
- Research critical for advancing the interests of all healthcare stakeholders – patients, clients/systems, design firms, and taxpayers
- There is a need to develop research-grounded business case assessments of healthcare design features or measures -- tailored to the specific payment/cost policies of Nordic countries