

**APPENDIX 1D.1**

**CRITICAL ELEMENTS OF THE PHYSICAL FEATURES OF AN ELDERLY FRIENDLY  
ACUTE HOSPITAL ENVIRONMENT**

A literature review undertaken for Fraser Health

By

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## Executive Summary

At the request of Fraser Health, a literature search was undertaken designed to identify critical elements of the physical features of an elderly friendly acute hospital environment. The project began with a search of five major seniors' and/or health-care related databases using a Boolean technique, that was focused on older adults, acute care hospitals, and key words relating generally to the physical/built environment. It was decided not to use as key words individual design elements such as noise, light, single vs. multiple patient rooms because much of the research on these elements was reviewed by Ulrich, Quan, Zimring, Joseph and Choudary (2004) in a document entitled *The Role of the Physical Environment in the Hospital of the 21<sup>st</sup> Century*.

Very early on in the search it became evident that while there was a large literature on Environment and Aging, much of it was anecdotal and, the bulk dealt with the residential environment and the long term care sector (i.e. with seniors housing, assisted living facilities, and long term care facilities). Where the hospital design literature referred to seniors, it too was focused mainly on long term care. Further, while many authors recognized that the exterior and interior design of the physical environment may contribute to accidents, declines in functional status, iatrogenic illness, social isolation, depression, confusion, etc. in hospitalized elderly, there were few reports of activities in the acute care sector that had tangibly built on this knowledge. The exception concerned the development of Acute Care for Elders (ACE) Units.

An ACE Unit is an area within a larger hospital that is specialized for acute care of the elderly. The ACE model has four key elements: a 'prepared environment', a philosophy of patient-centred care, interdisciplinary team rounds and discharge planning, and medical care review (Palmer, Councill & Landefeld, 1998). Randomized controlled trials are the gold-standard in health-related research in terms of determining the efficacy of an intervention. Using this research methodology, ACE Units have been found to produce positive patient outcomes.

### Recommendations

1. Given their demonstrated effectiveness in reducing length of stay, post-hospital admission rates to long term care facilities, and functional decline, ACE Units should be established throughout Fraser Health Region.
2. In their establishment, the four key elements should be phased in so that their relative weighting in terms of patient (and staff) outcomes can be determined.
3. Since some of the four elements may already be extant in hospitals in the region, a "report card" should be developed. This tool could be used for self-study or be externally administered.
4. Prior to development of the functional program for renovation or new construction of any public (and ideally, any private) acute care settings for the elderly, appoint a multi-disciplinary advisory committee, members of whom are or will become familiar with existing design guidelines for shelter and care facilities for older persons as well as Universal Design principles.

5. Apply Design for Dementia principles and interventions (e.g. wanderer monitoring technology such as alarmed doors) to all parts of acute hospitals used by substantial numbers of older persons.
6. Make post-occupancy evaluation a routine requirement for all renovation or new construction targeted to elderly acute care patients.
7. Facilitate research that will contribute to the currently limited body of knowledge concerning elements of the physical environment that contribute to positive outcomes among elderly persons hospitalized for acute conditions. This includes identification and replication of studies in the Ulrich, Quan, Zimering et al. (2004) review that were conducted solely with long term care patients, studies identifying environmental stressors as well as design preferences of elderly acute care patients, and behavioural observation studies conducted in venues such as the SFU-BCIT Living Laboratory.

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## CRITICAL ELEMENTS OF THE PHYSICAL FEATURES OF AN ELDERLY FRIENDLY ACUTE HOSPITAL ENVIRONMENT – A LITERATURE REVIEW

### 1. INTRODUCTION:

In the clinical care literature, various authors (e.g. Creditor, 1993; Miller, 2002) note that the elderly are at high risk for injury in acute care settings as a result of age related physical and sensory changes such as decreased visual acuity, loss of high-frequency hearing, decreased peripheral pain perception, degenerative joint changes and loss of skin turgor. As well, it is generally recognized that such elements of hospitalization as staff attitudes, care practices and the physical environment (e.g. high hospital beds with rails) may play a causal role in the accidents and injuries that take place among elderly acute hospital patients. Functional decline is commonly observed in hospitalized elderly (Creditor, 1993; Hirsch, Sommers, Olson et al. 1990). While diminished homeostatic reserve may be a major factor, activities of daily living such as washing oneself, transferring from bed to chair, or walking to the toilet may be rendered more difficult when the frail elder must perform them in the unfamiliar setting of an acute care hospital (Koenig, George, Stangl et al. 1995; Miller, 2002; Palmer, 1995; Palmer, Landefeld, Kresevic & Kowal, 1994). The aged are also at risk of social isolation in acute care settings as a result of both internal and external factors (e.g. sensory fading; staff who speak too rapidly or shout; mobility impairment; bedroom located far from the nursing station or dining/day room). Similarly, confusion in orientation and wayfinding in hospitals may result from both intrinsic and extrinsic factors (e.g. cognitive impairment, an acute illness or infection, poor signage, absence of effective orientation and wayfinding cues, hallway clutter, polypharmacy).

With reference to the specific focus of this literature review – on the physical environment of acute care hospitals -- Horsburgh (1995) notes that medical care cannot be separated from the building in which it is delivered. He contends that the quality of space in such buildings affects the outcome of medical care and that therefore, architectural design is an important part of the healing process.

In the Gerontological arena, this belief is recognized in the development of Acute Care for Elders (ACE) Units, the focus of Part 1 of the literature review presented in this report. ACE Units have four key elements, one of which is “the prepared environment”, which relates to the physical space in which the unit is located, including its configuration and furnishings. ACE Units also reflect the recent trend in the hospital design literature to conceptualize the patient as a “customer” rather than as a passive recipient of care and, to advocate for his or her treatment in a more homelike setting (See Part 2 of the literature review).

It is interesting to note that ACE Units are a relatively recent development –the majority having been established in the 1990s (Jayadevappa, Bloom, Raziano et al. 2003). The bulk of the Environment and Aging literature and within it, most design guidelines, focus on seniors housing and the long term care sector. Attention to acute care is noticeably absent in this literature – the exception is its use as an outcome measure. That is, long term care settings and treatment and prevention practices are evaluated on their ability to keep people *out* of hospitals.

When it became evident early on in the literature search that there was a dearth of design guidelines for making acute care hospitals senior-friendly, it was decided that it would be useful to see the extent to which seniors are recognized as a market by the acute care sector and what it is that they are seen as a market for. Part 3 of the literature addresses these questions.

Finally, it was thought to be useful to review design guidelines developed for seniors housing and long term care facilities and identify those that might also be applicable to the acute hospital environment. Part 4 of the literature review begins with a description of seniors housing and long term care design guidelines developed by the Canada Mortgage and Housing Corporation and other federal government agencies and department. Attention is drawn to the growing 'Design for Dementia' literature and guidelines deriving from it.

Underpinning the recommendations in many of the guideline documents mention in Part 4, is Lawton and Simon's (1968) Environmental Docility Hypothesis. This principle, which is central to the Environmental and Aging literature, posits that the less competent the individual, the greater the impact of environmental factors on that individual.

With aging, most people experience a reduction in competence. Changes in visual acuity, for example, and declines in high-tone hearing are considered to be part of normal aging. A disease or disability or injury that necessitates an acute care hospital admission will add to whatever losses in sensory, cognitive and physical capacity the person has already experienced. The added elements of disability may be temporary – a key goal of hospital care is of course to improve the person so that he or she is in better health and at a higher functional status level at discharge (or relatively soon thereafter) than when admitted. If this goal is to be achieved, it is essential both to treat the condition that led to hospital admission and to reduce the risk of adverse events taking place in hospital settings (e.g. falls, infections, delirium) among the increasing numbers of older persons that will be a continuing feature of Canadian population dynamics. This includes iatrogenesis deriving not only from poor care practices but also from less than optimal design of the physical environment. The physical environment of hospitals should enhance healing, not impede it. The objectives of this report and the broader activities in the health region that it is a part of, are designed to maximize the well-being of seniors in hospitals by identifying elements of the physical environment that are critical to creating age-friendly hospitals as well as to identify possible solutions for elements found to be faulty.

## 2. METHOD

Ulrich, Quan, Zimring, Joseph and Choudhary (2004) have undertaken an extensive review of the literature entitled *The Role of the Physical Environment in the Hospital of the 21<sup>st</sup> Century*. In this document they present evidence from over 600 "rigorous studies" that link the physical environment to patient and to staff outcomes, in four areas:

- Reduce staff stress and fatigue and increase effectiveness in delivering care
- Improve patient safety
- Reduce stress and improve outcomes
- Improve overall healthcare quality



The Ulrich, Quan, Zimring et. al (2004) review includes studies from both the acute and the long term care sectors – i.e. while the bulk of the research has been concerned with the impact of the physical environment of acute hospitals on patients and staff, some of the research was conducted in nursing homes and chronic care hospitals. However, in their report there is no separation of research findings on the basis of type of health care facility. Nor is their separation on the basis of the age of the patients – i.e. their review includes the impact of the physical environment of hospitals on persons of all ages including infants and young children.

Rather than treating health care facilities and their patients as homogeneous groups, in this present review, the focus was on acute care hospitals and on older adult patients.<sup>1</sup>

Shown below are five major databases that were searched, and the keywords that were used:

#### **AGELINE**

##### **Search Terms:**

ACE [KW]; Acute Care [KW][SU]; Architectural Design [SU]; Design [KW][TI]; Environment [KW][SU]; Hospitals [KW][SU]; Institutional Design [SU]; Older Adults [KW][SU]; Special Care Units [SU]

#### **CINAHL (CumulativeIndex to Nursing and Allied Health Literature)**

##### **Search Terms:**

ACE [KW]; acute care [KW]; Acute Care--In Old Age [SU]; aged [KW]; Design [KW]; elderly [KW]; Hospitals [KW]; Hospital Design and Construction [SU]; Hospital Units [SU]

#### **HEALTH SOURCE: NURSING/ACADEMIC EDITION**

##### **Search Terms:**

ACE [KW]; acute care [KW]; aged [KW]; architecture [SU]; Design [KW]; elderly [KW]; hospital architecture [SU]; Hospitals [KW]; Hospitals -- Design & Construction [SU]; ward [KW]; wards [KW]

#### **MEDLINE**

##### **Search Terms:**

ACE [KW]; acute care [KW]; aged [SU]; elderly [KW]; Hospital Design and Construction [SU]; Hospitals, Special [SU]; physical environment [KW]

Other references were derived from the list of references/bibliographies of publications that were retrieved. As well, colleagues belonging to the Environment and Aging interest group of the Gerontological Society of America were consulted. The resultant literature, once screened and found, in fact, to be relevant, was organized into the following broad groupings:

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<sup>1</sup> Taking a client-centred focus should not be construed as ignoring the importance of the physical environment on those who work in it. It is recognized that work environments can have a direct impact on care, as discussed in a recent editorial by this title that appeared in the *British Journal of Nursing* (Scott, 2004). The article summarized findings from a study conducted for the Commission for Architecture and the Built Environment by PriceWaterhouseCoopers which surveyed 479 directors and assistant directors of nursing across NHS hospitals in England (CABE, 2004).

- Specialized Units for Acute Care of the Elderly
- Trends in the Acute Care Hospital Design Literature
- Seniors Housing and Long Term Care Design Guidelines

Themes and highlights of each grouping are presented below.

### **3. LITERATURE REVIEW**

#### **3.1: Specialized Units for Acute Care of the Elderly**

In the health facilities design literature, one finds reference to geriatric units in hospitals. Examination of documents such as Volume I of Health and Welfare Canada's (1984) Facilities for the Elderly in Canada – Design and Environmental Considerations, indicates however, that the units for which those guidelines have been prepared are in fact, long term care facilities such as the Banfield Pavillion at Vancouver General Hospital or the Harry Purdy Pavillion at the University of B.C.

The focus in this literature review is on acute care and ways of making settings that provide it to older persons, more age-friendly. The bulk of acute care provided to the elderly takes place in emergency departments and in general medical and surgical wards or specialty wards (e.g. orthopedics) that serve a population of all ages. An ACE Unit, on the other hand, is an area within a larger hospital that is specialized for acute care of the elderly.

##### **3.1.1. The ACE Model**

The Acute Care for Elders (ACE) model of care is a multi-component intervention that has been shown in randomized controlled trials (Asplund, Gustafson, Jacobsson et al, 2000; Landefeld, Palmer, Kresevic et al, 1995; Palmer, Counsell, & Landefeld, 1998; Palmer, Landefeld, Kresevic, 1994; Kresevic & Holder, 1998; Councell, Holder, Liebenauer et al, 2000) to improve outcomes for older persons hospitalized for acute medical illnesses.

Key elements of the ACE model, according to Palmer, Counsell and Landefeld (1998) include:

- a prepared environment
- patient-centred care
- interdisciplinary team rounds and discharge planning, and
- medical care review.

Under the heading of prepared environment, Palmer, Landefeld, Kresevic and Kowal (1994, p.548) describe the following modifications made to a standard medical-surgical unit at University Hospitals of Cleveland, the first ACE unit to be developed (1985) and rigorously evaluated:

The environmental modifications of the ACE Unit, which were recommended by the investigators, build upon the experience of environmental experts in the design of long-term care facilities and acute care units. The ACE Unit was designed to foster patient

functional independence and to allay the disorienting and depersonalizing effects of the unfamiliar (hostile) environment of the hospital. The hallway corridor and patient rooms were carpeted, and clocks and calendars were prominently placed in each room. Carpeting patterns and wall coverings with visual contrast were chosen to aid patient orientation and way-finding. In addition, space for personal items from home was provided, special beds with floor lighting were added, additional lighting behind each patient's bed was installed, cubical curtains were added, and visually appealing paint and wallpaper colors were selected. Patient rooms were designed to permit privacy, while a large common space (activity room) was created to encourage dining outside of rooms, socializing, and light exercise.

Additional environmental interventions are described in a set of Nurse-Initiated Guidelines appended to the article. For example, assistive aids and bedside appliances such as trapeze bars, wheelchairs and Hoyer lifts are to be employed to facilitate mobility and transfer. As a means of falls prevention, recommended environmental interventions include:

...placing the patient's bed in the low position; keeping the call light, water, and accessories within patient reach; using dim light at night; placing furniture in non-obtrusive positions; raising bed-rails at night; checking carpet, floors and lights for repairs; raising heights of toilet seats; checking tips and heights of canes and walkers; and turning on intercom from patient room to nurse station (Palmer, Landefeld, Kresevic & Kowal, 1994, p. 551).

The ACE unit at University Hospitals of Cleveland consisted of 15 beds on a 29-bed general medical nursing unit. To determine its effectiveness, a randomized clinical trial was conducted. At admission, 661 acutely ill patients age 70 or older were randomly assigned to the ACE unit or to usual care on one of the hospital's general medical care. Among 603 patients discharged alive, ADL was better at discharge than on admission in 34% of ACE patients, compared to 24% of usual care patients, unchanged in 50% and 54% respectively, and worse in 16% of ACE compared to 21% of usual care patients. Fewer ACE patients were discharged for the first time to institutional long-term-care settings. Both of the above findings were statistically significant (Palmer, Counsell & Landefeld, 1998).

To determine whether the findings were generalizable to a community hospital and to determine effects over a longer time period, a second ACE unit was developed, at Akron City Hospital. It consisted of a 34-bed unit that was renovated to provide the "prepared environment" of ACE, which included carpeting, uncluttered hallways, etc. as well as a room for physical therapy and a parlor for dining and visiting with family. The result of a randomized control trial of 1531 patients aged 70 and over admitted over a 2.5 year period (Counsell, Holder, Liebenauer et al. 2000; Counsell, Landefeld, Parlmer, et al. 1996) showed ADL decline to be significantly less frequent in the ACE group than among controls both at discharge and during the year following hospitalization

Following the reporting of these and other positive outcomes of the Cleveland and Akron studies (Flaherty, McClanahan, Messner, et al. 1998; Holder, Counsell, Liebenaurer, et al. 1997; Counsell, Landefeld, Palmer et al. 1997), other ACE units were established. A survey conducted

in 2000 (Jayadevappa, Bloom, Raziano et al. 2003) identified 16 ACE units. Half were located in the northeastern part of the USA, 25% were in the south and 25% in the midwest. Most (85%) were in urban centres in large hospitals (average number of beds =709) The average daily census was 56 in the ACE units; 44% had telemetry beds, reflecting a high acuity level of care. A majority of patients were aged 71-80. The most common admitting diagnoses were congestive heart failure, pneumonia, and respiratory infections. The average length of stay in the units was 5.2 days.

Siegler, Glick and Lee (2002) conducted a survey of ACE units focused on staffing but which provides some information on physical environment features.

They defined an ACE unit as having the following four characteristics:

- A separate physical environment that is sensitive to the needs of the elderly (could be shared with other services)
- Joint medical director/nurse manager responsibility
- Multidisciplinary collaboration
- Specific admission criteria

They identified 18 units in the United States that met their criteria. Twelve of the ACE units were in university hospitals and 6 in community hospitals. Fourteen of the 18 were separate units; four shared space. The number of beds in the units ranged from 6-34 (mean and median number of beds was 20). Thirteen had congregate dining facilities but a survey of the units' medical and nursing managers indicated that on average, only about a quarter of the patients dined outside their room (range 0-75%) indicating that these were not heavily used. Some respondents in fact commented that patients were "too acute" or "didn't want to" use the congregate dining room. In response to a question about what was special about the units, the most frequently mentioned elements were the interdisciplinary nature of rounds or discharge planning (9 units), the interior design (5 units), staff education (4), restraint free (4) and intensive therapy or group exercise (4). Specific environmental design features and/or equipment mentioned included alarms, easy-to-handle food trays, and handicap access (each mentioned by one unit).

Spera, Monson and Hernly (1991) describe an ACE unit developed at Danbury Hospital in Danbury, Connecticut specifically (1) to provide comprehensive, quality nursing care to older inpatients that have progressed beyond the most acute phase of their illness but who still required hospitalization and (2) to reduce costs. The first goal was addressed primarily by placing a geriatric nurse practitioner in the position of nurse manager, thus adding a strong clinical component to the role. The second goal was mainly addressed by an alteration in the staff skill mix from the typical medical unit 74% professionals to a 50% professional to non-professional ratio. Renovation to the patient care area also took place. Hand rails were installed and a wheelchair shower was added. Large-dial clocks were placed in every patient room and a communal dining room and day room were added. Like Siegler, Glick and Lee (2002), these authors noted that for many, taking meals in the communal dining room is not possible. They also reported logistical problems, particularly at breakfast time, in getting patients to the dining room and that there are some patients who will not participate in communal dining.

## Use of the communal dining room as a therapeutic milieu

Parks (1994) describes a 19-bed medical-surgical ACE unit in a community hospital in which patients with IVs and oxygen often play cards or work puzzles or visit with their grandchildren in the day/dining room. The room is equipped with the necessary outlets for oxygen, room air, and suction. However, the hospital environment is de-emphasized through the addition of comfortable sofas and chairs, and a game table, to the two tables that accommodate four each at meal-time. Other furnishings include a stereo, TV, VCR, a library with many large print books, and a collection of big-band, devotional and old radio show tapes. Additional features include magnifying glasses, special voice amplifiers, canes and walkers. Framed prints show common city scenes and landmarks; others "promote positive aging" (p.64).

## De-institutionalizing patient bedrooms

Interior design features of patient rooms on ACE units, designed to enhance the concept of a non-institutional environment and emphasize wellness rather than illness, include:

- Carpeting (Palmer, Landefeld, Kresevic and Kowal , 1994; Parks, 1994)
- Draperies (Parks, 1994)
- Large clocks, bulletin boards and calendars (Palmer, Landefeld, Kresevic and Kowal, 1994; Parks, 1994)
- Quilted bedspread (Parks, 1994)
- Wallpaper (Palmer, Landefeld, Kresevic and Kowal, 1994; Parks, 1994)

### 3.1.2 Specialized ACE Units

Panno, Kolcaba, and Holder (2000) advocate the application of ACE principles and Comfort Theory in surgical orthopedic units. Staff education and the development of best practice protocols to facilitate assessment and falls prevention are emphasized. With respect to the physical environment, the authors suggest that it should promote reality orientation, mobility, ambulation, and safety. One specific recommendation is that patients' rooms should be free of clutter, except for necessary equipment and "comforting belongings". A second is that fresh "comfort foods" and nourishment should be available 24 hours a day to encourage eating.

Flaherty, Tariq, Raghaven et al. (2003) describe a model for managing delirious older inpatients that involves an ACE unit and Delirium Room (DR). The 22-bed ACE unit is located in the Saint Louis University Hospital, a 380 tertiary care hospital. Renovations to establish it consisted of converting the centre of the main nursing station into a patient dining/day room area. Mini nursing stations were set up on the periphery of the new area. A storage room next to the previous nursing station became a multidisciplinary room. Two double rooms nearby were converted into a four-bed DR by removing the wall that separated the rooms. To ensure close observation of patients, one of the units' staff, usually a certified nursing assistant, was assigned to the DR at all times. A small nursing station (desk with computer) was placed within the DR for her use. Curtains separated the beds to provide patient privacy, lighting was enhanced and sources of excess noise and distracters (e.g., television sets) were removed or minimized. The

intervention was successful. There was no significant difference between LOS and expected LOS based on DRG among the 69 patients admitted to the DR over the 1-year course of the study. None died while in hospital. Of 49 admitted from home, 17 (34.7%) returned home upon discharge. The remainder was discharged to a care facility. Only 9 (13%) lost function while in hospital. The researchers note that their ability to manage more than one delirious patient at a time without physical restraints or excess pharmacological restraints suggests that previous recommendations against putting delirious patients together based on risk of increasing agitation may be unwarranted.

Allen, Hazellett, Palmer et al. (2003) describe application of ACE unit principles to a stroke unit (SU). These included creation of a stroke interdisciplinary team, development of evidence-based stroke orders and protocols, and a redesigned physical environment. Administrative data indicated that average length of stay was shorter (3.8 days vs. 4.6 days) among patients post- as compared with pre-SU, that SU patients were more often discharged home and that they had a lower readmission rate during the following year. The authors note, however, that randomized trials for SU using an ACE model have not been conducted. Furthermore, they identify a need for studies that determine which elements of SU and ACE models make a difference to patient outcomes.

### **3. 2. Trends in the Acute Care Hospital Design Literature**

#### **3.2.1. Marketing for Customers and Repeat Users**

In reading the acute care hospital design literature, particularly that emanating from the United States, one is immediately struck by the use of marketing language (e.g. patients referred to as customers) and the concern with making hospitals attractive and positively regarded, not so much as a way of improving patient outcomes, but more as a vehicle for increasing the probability of initial selection and repeat use. As Martin (2000) notes, in North America, health care design is important because it can confer an advantage in a competitive managed care environment. Health care is a business in the USA. Hospitals will not make money if they lack customers. In the opening paragraph of an article entitled "Do appealing hospital rooms increase patient evaluations of physicians, nurses, and hospital services?" Swan, Richardson and Dutton (2003) state:

Customer evaluation of services is of great concern to both health care services practitioners and researchers. The physical surroundings in which services in general are delivered have been found to influence customer judgments of service performance including customer satisfaction, loyalty, favorable word of mouth (WOM) recommendations, and service quality perceptions...A common finding in the health care literature is that the physical facilities are a component of patient evaluation of health care services. (p.254)

A number of articles can be found that describe ways of achieving a more pleasing physical environment. The first group to be discussed reflects what I have termed "The traditional

architectural approach". A second group, discussed next, reflects "The guest service industry approach".

### **3.2.2. Ways of Improving the Physical Environment of Hospitals**

#### **3.2.1.1. The Traditional (4-Pillar) Architectural Approach**

Horsburgh (1995) in an article entitled "Healing by design: Architecture of hospitals" identifies four qualities of space that have traditionally be identified by the architecture profession as being characteristic of good architecture: orientation, connection, scale, and symbolic meaning. A number of important issues and recent trends are identified as he discusses these four "pillars" of architecture.

##### **i) Improve Orientation and Way-finding Systems**

He begins his discussion of orientation by noting that in most hospitals there are a "riot of signs and profusion of colored lines on the walls and floors... [that]... give testimony to the difficulty patients have in finding their way". He notes that people who are hospitalized are under stress (a point underscored by Shumaker & Reizenstein, 1982) and are more susceptible to information overload. Most are infrequent users and unfamiliar with hospitals. They and their families are easily frustrated by spatial configurations that are not immediately legible.[For the gerontologist, red flags immediately go up, or should, as one contemplates the added stress that would be engendered by the 'riot' of signs and colors for persons with cognitive impairment.]

In terms of design solutions, Horsburgh notes that the ability to see where one is headed increases people's sense of orientation. Examples are provided of hospitals that provide clear and direct visual cues as to the location of the main entrance and once through it, have broad straight circulation paths along which departments are arranged in a logical order (e.g. outpatient department, admissions, financial services, radiology, to the inpatient area). He also recommends the use of landmarks – easily remembered objects that can be used as reference points (e.g. sculptures, fountains and gazebos) as well as color-coding and differentiating functional different sections of the hospital by varying their ceiling height. For further solutions, the reader is advised to see the section on ways to reduce spatial disorientation in the Ulrich, Quan, Zimring et al (2004) report. It should be noted that these authors recommend that elements be integrated and coordinated into way-finding systems rather than dealt with piece-meal.

##### **ii) Foster Connection with People and Nature**

Connection, the second of the architectural "pillars" discussed by Horsburgh, refers to ways that architectural design can help hospital patients feel that they are still part of the community and that links them both with people and with nature. Examples are provided of hospitals in which people who are convalescing can visit an atrium lobby that contains shops and fast food outlets arranged like a "street scene". Parker (2004) in an editorial in the *Journal for Healthcare Design and Development*, a British publication, notes that the inclusion of atria, concourses, food courts, and what he terms "lively social spaces" in circulation areas is becoming almost a given in hospital design. These, he claims, engender social interaction and information exchange and thus

are health promoting, justifying their cost. He notes however, that critics of this trend are concerned that standard internal patient areas are often left "...mean and depressing due to being 'back-of-house'; and therefore perceived as less important in terms of corporate image" (p.4).

Horsburgh presents a more positive view of architectural design of patient areas. He notes a trend towards inclusion of what he terms "community spaces" in these - in particular, he highlights the Planetree concept (Martin, Hunt, Hughes-Stone & Conrad, 1990). Developed at Pacific Presbyterian Medical Center, a 272-bed tertiary care hospital in San Francisco, the Planetree Model Hospital Unit consists of a standard hospital unit in which the nurses' lounge and utilities were converted in a patient lounge and kitchenette. Other renovations included removing the counter of the traditional nurses station and housing equipment such as medical charts and linen bins in oak-paneled cabinets and closets, adding carpet and acoustical wall treatment to the core area to lower noise level and brightening patients' rooms by providing floral sheets, colored bedspreads and pastel instead of white curtains around the beds.

In the section of his article dealing with connection, Hosburgh also cites a number of studies which suggest that views of nature have therapeutic benefit and argues against the tendency to eliminate windows from hallways, intensive care units and other hospital areas. Under the heading "provide nature and positive distraction", Ulrich, Quan, Zimring et al. (2004) provide a review of research suggesting that rooms with a view are beneficial to hospital patients, as are hospital gardens and representational nature art works. They caution against the use of abstract art and emotionally challenging art in healthcare settings.

Not mentioned in the Ulrich, Quan Zimring et al. (2004) report, are any studies relating to the "street scene concept" referred to above. In this writer's opinion such research is warranted in light of a recent (January 3, 2005) Associated Press news item entitled "Health hospital food? McDonald's in a renowned clinic is a source of heartburn". The article (Kropko, 2005) describes an attempt by the Cleveland Clinic in Cleveland, Ohio, renowned for its research into heart disease, to break its lease with McDonald's. Apparently McDonald's is in 36 hospitals across the USA and it is not uncommon for hospitals to earn revenue by leasing space to food court companies or restaurants. The President of the American Association for Health Care Service Administrators indicated that there are hospitals throughout the USA that have fast food outlets. She was unaware of any others following Cleveland's lead and stated "It becomes a philosophical question that has to be answered in every hospital. Do we serve healthy foods because we're in a health care facility, or do we serve what the customers are interested in having?"

### **iii) Pay Attention to Scale**

The third architectural pillar, scale, is concerned with the relationship between the size of architectural forms and spaces and that of the human figure. Hosburgh notes that hospitals of about 180 beds "...permits the integration of hospital functions without sacrificing human scale, and this may be one reason this size remains the U.S. hospital average". Interestingly, Victoria General Hospital is provided as an example of a successful solution that maintains appropriate scale while allowing for future expansion. He notes that its free-standing 5-story patient wings, connected to the hospital's service core by walkways, are well integrated with the surrounding



natural environment. [The issue of scale is not addressed in the Ulrich, Quan, Zimring et al. (2004) review.]

#### **iv) Think About Symbolic Meaning – Especially Ways to Remind People About Home Sweet Home**

Hosburgh identifies an important trend in acute hospital design when he states, in his discussion of symbolic meaning, that the importance of using design to create a homelike feeling in hospitals has recently been recognized. Examples he provides include the Planetree model and birthing suites, both incorporating bedrooms that resemble those found in a home rather than hospital rooms.

In the Environment and Aging literature, there is frequent reference to the importance of making residential care environments as homelike as possible. The objective, especially in facilities catering for frail elders with cognitive impairment, is to use the environment to cue and facilitate the transfer of well learned skills related to activities of daily living, thereby enabling the person to remain independent longer. Fostering independence is viewed and valued both as a means of maintaining residents' morale as well as of reducing staff workload.

In contemporary literature relating to hospital architecture one finds frequent reference to the need to create a more homelike environment (e.g. Fottler, Ford, Roberts et al., 2000; Horsburgh, 1995; Martin, 2000; Martin, Hunt, Hughes-Stone & Conrad, 1990). Doing so serves a different purpose in the acute care setting, however. Horsburgh (1995) notes that for the past 50 years, hospital architecture has symbolically reflected society's preoccupation with the biologic and technological advances of modern medicine though its use of clean, streamlined facades and exposed structural and mechanical elements. The idea has been that people will be reassured by such design that the highest level of medical care would be found within its walls. However, what has happened instead is that people have felt dehumanized and depersonalized in modern hospitals. Horsburgh contends that "Making the hospital more homelike and less impersonal is an important way to indicate that the focus of the hospital is on the individual person" – that is, that he or she is not just a "case".

Martin (2000), in reviewing the 2<sup>nd</sup> International Conference on Health and Design for *The Lancet*, referenced a survey conducted by Horsburgh, of hospital architects who had themselves been admitted to hospitals as a result of a serious illness or who had visited a family member or friend in hospital. He noted that:

Unsurprisingly, the survey showed that the architects were critical of health-care facility design, particularly difficulties experienced in way-finding within hospitals and poor design of inpatients' rooms. Like the rest of us, architects value a homelike environment in which they can control noise and light" (p.518).

The findings are important in highlighting three issues: a) the difficulties that occur with way-finding in hospitals -- even among hospital design professionals! b) the importance to acute hospital patients of predictability and control and c) the need to identify specific elements of "homelike" that are important to hospital in-patients such as the ability to self-control lights, temperature and door closure. With respect to the latter, a study by Moore, Nguyen, Nolan et al.

(1999) showed that closing patient doors on surgical floors decreased noise an average of 6.0 dB, a change that the patients readily perceived. Staff education sessions that included using pagers in vibrate mode, minimizing overhead announcements, and moving physician teaching sessions away from patient beds, on the other hand, failed to have an impact.

On the topic of noise, many studies have shown that hospitals, especially in critical care units, often exceed the World Health Organization guideline values of 35 dB during daytime and 40dB at night (Ulrich, Quan, Zimering et al, 2004). Excessive noise levels in hospitals have been implicated in slower recovery rate, slower rate of wound healing, enhanced pain perception, stress (Moore, Nguyen, Nolan, et al. 1999; Ulrich, Quan, Zimering et al, 2004). Noise has been found to be the major cause of awakening and sleep loss in hospitals (Ulrich, Quan, Zimering et al, 2004). Sleep loss, in turn, has been considered a contributing factor to a number of the adverse events that occur in hospitals including the development of delirium in ICU patients (Williams, 1989).

Southwell and Wistow (1995) note, however, that beside noise there are other sources of sleep disturbances in acute care hospitals, a major one of which is treatments. Other sources include pain, undimmed lights and discomfort. They conducted a study in three UK hospitals in which both patients and nurses were asked about the most common causes of sleep loss. The five most common sources of night time disturbance reported by patients were: other patients making a noise (reported by 34% of the 454 patient respondents), nurses attending to other patients (26%), telephones ringing (19%), other patients calling for help (17%), and lights inside the ward (14%). Other sources of disturbance mentioned by from 10%-13% of patients were: nurses talking to each other, emergencies on the ward, other patients using a commode or toilet, having a treatment, and nurses talking to other patients. It is interesting to note that while the top five sources of disturbance were also given prominence by nurses, there were some statistically significant differences between the perceptions of the two groups. For example, more patients than nurses reported disturbances arising from: noise outside the ward, emergencies, patients making a noise, nurses' shoes and nurses talking to each other. A number of environmental modifications are suggested by Southwell and Wistow as ways of reducing disruptions to patient's sleep. These include: providing floor coverings that reduce noise, providing sound-proofing of toilets on wards and bays; and fitting double-glazing where noises from outside the ward are obtrusive at night. A review of ward layouts is also recommended. The authors note that bays have always been considered to be quieter than 'Nightingale' style wards but that view was not supported by the data. Finally, it should be noted that fewer nighttime disturbances were reported by patients on geriatric wards than on wards of other specialties. The authors attribute this to greater use of sleeping pills on geriatric wards.

On the issue of predictability and control, while there are data from the long term care sector, including the classic studies of Schultz (1976) and Schulz and Hanusa (1978) looking at outcomes among elderly care facility residents, these focused on having knowledge of or input into when students would come to visit and on such activities as tending plants and filling bird-feeders (Banziger & Roush 1983). Giving remote control devices to older patients (or patients of any age) to turn their room lights on and off, open and close the curtains, open and close windows, open and close the door, adjust room temperature, or in other way exert control over the physical environment in hospitals has not, it seems, been systematically explored. There also

appears to be a dearth of research on the application of 'smart' technology to patient areas in chronic or acute hospitals. Where it is referenced, it is mainly concerned with movement monitoring. For example, Banerjee, Couturier, Steenkeste et al. (2004) installed an automated system of passive infrared sensors in an experimental hospital room to monitor the nocturnal activities of Alzheimer's disease patients.

With respect to creating more home-like environments it is important to ask the question "Home-like according to whose perspective?" A key question cross-cutting this and other issues is whether the physical environment-related problems with existing hospitals and the potential design solutions that might improve them are the same for older and younger adults, or for people of differing socio-economic status. Gender and culture are of course two other important cross-cutting variables that need to be explored.

### **3.2.2.2 The Guest Services Industry Approach**

In the abstract for an article entitled "Creating a healing environment: the importance of the service setting in the new consumer oriented healthcare system", which appeared in the *Journal of Healthcare Management*, Fottler, Ford, Roberts et al. (2000) note that over the last decade, the healthcare industry has come to recognize the importance of physical environment to consumers. They go on to argue that if the industry wishes to understand how best to deal with the environment so as to attract and retain customers, it would do well to take some lessons from the guest services (hospitality) industry. Two of the most important principles from this industry are then identified: (a) Provide the setting the customer expects and (b) Create an environment that meets or exceeds customer need for safety, security, support, competence, physical comfort and psychological comfort.

#### **i. Provide the Setting the Customer Expects**

Swan, Richardson and Hutton (2003) contend that consumers, including healthcare consumers, have an idea of what the setting in which a particular service is delivered is supposed to look like. The "prototypicality paradigm" (Ward, Bitner and Barnes, 1992) suggests that the degree to which an actual setting matches one's prototypic imagine of it determines satisfaction. Satisfaction with the setting, in turn, is hypothesized to generalize to satisfaction with actors and actions that take place in the setting. In their study, patients in appealing rooms (bright, clean, new) rated their hospital experience more favourably than patients in standard rooms, although both groups received the same treatment.

#### **ii. Create an Environment that Meets or Exceeds Customer Need for Safety, Security, Support, Competence, Physical Comfort and Psychological Comfort,**

Fottler, Ford, Roberts, et al (2000) contend that customers expect the environment to be easy to use, easy to understand and safe. They expect to be able to enter and exit without getting lost, hurt, or disoriented. "Good lighting, open space, smiling employees who make eye contact with customers, and cleanliness make customers feel secure..." In the healthcare setting, they contend, it is also important to meet or exceed customers' needs for competent care, physical comfort and psychological comfort. Examples are provided of hospitals that use "patient-focused design".

These include one in which the orthopedic section has its own rehabilitation and imaging components for the convenience of patients and staff rather than having these centralized, as had previously been the case.

Other trends reflecting the guest services/hospitality industry approach concern building materials. Gardener (2004), for example, notes that wood is increasingly being used in both the exterior and the interior of healthcare environments in the U.K. and Canada. He notes that "unlike concrete walls, shiny vinyl floors or polystyrene ceiling tiles, wood has a warm and friendly, as well as natural, characteristic" (p.14). He quotes the architects of a recently constructed hospital in Coventry extolling the sensory qualities of wood ("What you touch in a hospital should feel good and look good" p.14) as well as associating it with stress-reduction ("We want the area to be as calming and un-hospital-like as possible...It's got to be more like a hotel or residential development" p.15).

### **3.3 Recognition of the Seniors Market in the Acute Care Design Literature**

Thomas and Bobrow (1984) in an article which appeared in *Hospitals*, note that since the majority of people over 65 are potential private-pay hospital service users, hospitals should consider building special facilities that can be marketed to them. These include hospice units, ambulatory care units, as well as assisted living and long term care facilities that can be built on their grounds in a campus-of-care model. They also suggest that hospitals should move beyond bricks and mortar. Foreshadowing the development and widespread marketing of Personal Emergency Response systems, recommendations include establishing a two-way telecommunications centre tied to an ambulatory care centre or a hospital-based emergency department. This approach, they note, "preserves the hospital as the basic referral base for inpatient care" (p.84). They go on to state:

At home service components of such a network could easily be contracted through a security system with a fleet of cars. The network would provide routine checks on citizens; a distribution system for shopping services, grocery deliveries, and cleaning services including linens, other standard hospital-based supplies and equipment; and meals. Reimbursement for these services could be done on a private-pay basis through creative refinancing of homes or by other means of freeing locked-in assets (p.84).

Some of the above recommendations of course would not be applicable to the current situation in British Columbia where on-site hospital laundry, cleaning and meal preparation facilities, rather than being viewed as potential revenue generating units, are being phased out and substituted for by contracted-out services. It is interesting however, that the authors choose to focus on the development of new services rather than on making the core services of acute hospitals more age-friendly. Other authors, especially those with a background in health economics, are quick to point out that seniors make disproportionate use of acute care hospitals and it has been noted that with the exception of pediatric and maternity wards, constitute a majority of patients on most hospital wards. Given their numbers, and potential to be paying customers of acute hospitals, it is surprising that hospital administrators have not paid more attention to addressing their needs and preferences. It appears that to date concerns about hospital design guidelines and physical environment-related innovations to improve acute care of seniors have come mostly from

geriatrics and gerontology practitioners, and that the development of ACE Units have been the main product of this concern.

### 3. 4. Seniors Housing and Long Term Care Facility Design Guidelines

In contrast to the case of the acute care sector, there are an abundance of American and Canadian design guidelines for seniors housing and long term care facilities. For example, dating back to the 1970s, the Canada Mortgage and Housing Corporation (CMHC) has been responsive to population aging in a number of ways. These include, at the project or community level:

- pioneering a series of design guidelines for housing and care facilities for seniors (CMHC, 1975, 1973, 1983; 1988) that drew attention to the need to accommodate the sensory and motor changes that commonly accompany aging;
- in the 1980s, using Section 56.1 (since rescinded) of the *National Housing Act*, to provide financial assistance to non-profit societies and cooperatives to develop projects to house low-income families and/or seniors – specifically, by bridging the gap between the project owner’s mortgage payments and operating costs and the rents low-income residents could afford to pay - the latter identified as no more than 25% of income (Nicklin, 1985);
- under Sections 44 and 56.1 of the *National Housing Act*, partnering with provincial governments in developing, owning and managing self-contained dwellings for low income seniors and/or assisting non-profit societies to do so (Nicklin, 1985);
- financing the construction of the residential components of intermediate care facilities (Nicklin, 1985);
- fostering public-private partnerships in the development of housing projects targeting older persons (Lusk, 1994);
- identifying new housing forms and sponsoring demonstration projects such as for “granny flats” in the 1980’s (Hiscox, 1985) and FlexHousing in the late 1990’s (Rodriguez, 2004);
- fostering the development of tools to assist communities in identifying housing needs in small communities and rural settings (Hodge & Gutman, 1991).

As well, CMHC has offered a number of programs and information targeted to individual seniors. The vast majority (92.6%) of seniors, it should be noted, lives in private households and at any point in time approximately 2/3 are homeowners. The majority of the homes that are owned by elderly Canadians are single family detached dwellings – usually a one or two storey house with a front and backyard. Tenure is often long – 25 years on average (Chawla & Wannell, 2004). Often, the home the senior is living in is the home in which the family was raised. Purchased many years earlier, it may no longer meet the seniors’ needs – for example, it may have entrance or internal stairways that are difficult for persons with arthritic joints or heart or respiratory ailments to climb and are impossible for those confined to a wheelchair. It may have bathrooms that, lacking grab-bars and non-slip surfaces, pose a safety hazard for mobility impaired elders or persons with balance problems and are non-functional for those requiring wheelchair turning-space and/or who cannot bathe or toilet independently. While on average, senior homeowners have substantially higher incomes (\$41,000 in 1999) than senior renters (\$23,000), a sub-set of homeowners (79,700 or 5.3%) were classified as low-income families (Chawla & Wannell,

2004). These people, who are often described as being "asset rich but income poor", may find it financially difficult to make the necessary renovations to adapt their home to their current needs. CMHC has a program called Home Adaptations for Seniors' Independence (HASI) that provides a forgivable loan of up to \$3,500 for homeowners (and landlords) to help pay for minor home adaptations to extend the time low-income seniors can live in their own homes. Examples of adaptations that qualify for HASI funding include: installation of handrails, easy-to-reach work and storage areas in the kitchen, lever handles on doors, walk-in showers with grab bars and bathtub grab bars and seats. Low income seniors may also qualify for financial assistance under the Residential Rehabilitation Assistance Program for Persons with Disabilities (RRAP-Disabilities). The RRAP program was first established in 1974. At that time it offered loans of up to \$10,000 to help improve housing quality. Currently, assistance in the form of a forgivable loan of up to 100% of the total cost of modifications is provided to homeowners and landlords. The maximum loan amount varies as a function of geographic location (higher in far Northern areas than in more southern parts of Canada) and tenure and type of dwelling (higher for rental than for homeowner/rooming house). CMHC has developed a self-assessment guide called *Maintaining Seniors' Independence Through Home Adaptations* (CMHC, 1993). Each of the sections of the guide deals with an activity in the home. The senior is instructed that in using each section, he/she should first decide if the activity poses a difficulty and if so, to examine the types of adaptations described in the section and decide if these would be helpful. The next step is to decide if the adaptations can be implemented by the senior or a family member or friend or if a contractor is needed to carry out the work. The guide can be used as the basis for obtaining tenders and negotiating with the contractor.

Design guidelines for seniors housing and care facilities have also been developed by other agencies of the federal government. These include: *Housing an Aging Population: Guidelines for Development and Design* (National Advisory Council on Aging, 1987), *Facilities for the Elderly in Canada* (Health and Welfare Canada, 1984) and a three volume set entitled *Living Accommodations for Seniors: Facility Planning and Design Guidelines* (Health and Welfare Canada, 1988).

What these, and similar documents published in the USA and UK (e.g. American Institute of Architects, 1985; Regnier & Pynoos, 1987; Bush-Brown & David, 1992), have in common is that they all begin by reviewing the physical, psychological and social changes and losses that commonly accompany aging. Methods of compensating for these losses in the design of the built environment (prosthetic design) or at least taking account of them are then described. For example, the Health and Welfare Canada (1984) design guidelines note that:

...The elderly not only require more light to see details clearly, they are also more sensitive to glare from light sources, floors, walls and glass areas. Glare from these points not only causes increased discomfort but also poses a potential threat to the patient's safety. Some of the common sources of glare are from high horizontal windows, surfaces painted with glossy finishes, and long corridors which are end-lit.

The older eye takes longer to adjust to changes in lighting levels. This delayed adjustment is most acute when the patient moves from a dark into a brightly lighted zone or vice versa. Such obvious and even less dramatic contrasts should be avoided for safety

reasons.

Glare from windows can be effectively reduced with shading devices such as venetian blinds or curtains, brise-soleil or awnings which do not impede the view, or blinds in between two layers of glass. ...Glare in corridors can be reduced with the use of indirect lighting and non-glare surfaces.

The placement, size and shape of windows should also be used to reduce the amount of glare in all patient-oriented areas. Since the distribution of light is affected by the reflecting properties of the surfaces in the room, special care must be taken in selecting floor and wall finishes (colour & texture). (p. 40).

The above information, which is found in virtually all of the design guideline documents referred to above, is as accurate and as relevant today as it was in 1984. It is also as applicable to acute care hospitals as it is for seniors housing and long term care facilities. The same can be said for many of the other design guidelines contained in the long term care literature.

In an article entitled "Environmental changes geared towards the elderly in an acute care setting" Dennis (1988) tells of a committee overseeing renovation of a wing of the Toronto East General Hospital that reviewed the available design literature and implemented some of the seniors friendly recommendations contained in it. The changes affected five design elements: colour, room signage, accessories, activity area, and floors. Specifically, they:

- Changed the colour of the walls in the corridor and patient rooms, using hues in the red-orange end of the spectrum since it has long been known that these are easier for older adults to discriminate between than those at the blue-green end.
- Placed an accent stripe behind the handrail in the corridor, to enhance its visibility
- Alternated four colors to make it easier for patients to find their room
- Painted distance markers on the hall wall as part of the accent stripe, to encourage walking
- Lowered signage in patients' rooms ( from the 6 to the 4 foot level) to increase visibility
- Installed room numbers inside the patient rooms to aid orientation
- Placed large name card holders on the wall above the patient's bed to assist visually impaired patients to locate their bed.
- Installed plant shelves, added photos of "old Toronto", bulletin boards, clocks, and wheelchair level mirror in patients' rooms to make them more cheerful and enhance orientation
- Encouraged personalization of space
- Converted a conference room into a patient activity area and equipped it with books and reading lamps; 'garden centre' for patients with an interest in horticulture; shelf containing games, puzzles, cards; tape player and cassettes.
- Changed type of wax used on the floor to reduce glare and prevent falls

These renovations were made because the committee felt that "...It was important to keep in mind needs of geriatric patients while suggesting ideas that would gear the environment towards needs of an active treatment medical unit" (p. 4).

It should be noted that in addition to the above mention design guidelines, there is also a separate and growing literature on 'Design for dementia'. The Canadian federal government is represented in this literature also. For example, in the early 1990s, Health and Welfare Canada (1991) published *Designing facilities for people with dementia*. A decade later, in recognition of the fact that about half of those with a diagnosis of dementia are being cared for in the community (Canadian Study of Health and Aging Working Group 1994) and that prevention of caregiver burnout is a serious concern (Canadian Study of Health and Aging, 1994), CMHC published a guide entitled *At Home with Alzheimer's Disease*. This document (CMHC, 2000), contains suggestions on how to improve the safety and security of persons living at home with Alzheimer's disease by making minor, low-cost changes to a house or apartment.

Neither of these documents, however, nor such well-known U.S. guides as Calkins' (1988) *Design for dementia – Planning environments for the elderly and the confused* or Cohen, Weisman, Steiner et al.'s (1988) *Environments for People with Dementia: Design Guide* appear to be referenced much if at all, in the acute care literature dealing with seniors. This appears to be a glaring omission since as Sheps, Reid, Barer et al. (2000) demonstrate, with data from the BC Linked Health Database, within the 65 and over population, the largest growth in acute care use between a 1986 and 1995 was in persons aged 85 and over. Prevalence studies (e.g. Canadian Study of Health and Aging Working Group 1994) show that in this age group a diagnosis of dementia is present in about 40% of people.

#### 4. SUMMARY AND RECOMMENDATIONS

This literature review has focused on seniors and the physical environment of acute care hospitals. While it was designed to identify key elements of the physical environment of hospitals that are or need to be made age-friendly, it was clear fairly early on in the review that this would not be a straight forward task. Many authors recognize that the design of the physical environment may contribute to the accidents, declines in functional status, iatrogenic illness, social isolation, depression, confusion, delirium, etc. that have been observed to take place in hospitalized elders. Few report activities that act on this recognition. Even fewer have followed renovations or new construction with post-occupancy evaluation (POE) studies.

While different from POEs, randomized-controlled trials are the gold-standard in health-related research. Being of this genre, the ACE Unit studies stand out as a bright beacon. The first and strongest recommendation from this review would thus have to be that the Fraser Region set as its goal to establish these in as many hospitals as possible. They have been demonstrated to "work" in terms of a variety of staff assessments and patient outcomes, including such important health economics indicators as reduced lengths of stay and reduced long term care institution admission rates (Palmer, Counsell & Landefeld, 1998). ADL decline has also been shown to be significantly less frequent in ACE Unit patients than among controls (Counsell, Holder, Liebenauer et al. 2000; Counsell, Landefeld, Parmler, et al. 1996).<sup>2</sup>

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<sup>2</sup> It is interesting to note that the type of unit in which the patient was treated was not included in the variables examined in a recent (McCusker, Kakuma & Abrahamowicz, 2002) systematic review of predictors of functional decline in hospitalized elderly patients. To do so, is a recommendation for future research.



Where a major contribution to care of the elderly could be made by Fraser Health is in the way in which implementation takes place. For example, the ACE Unit literature makes it clear that alterations to the physical environment are an important component but not the only component to this intervention. Others identified (Palmer, Counsell & Landefeld, 1998) include a philosophy of patient-centred care, interdisciplinary team rounds and discharge planning, and medical care review. Rather than making all the changes at once, it would be useful to phase them in – thus enabling determination and demonstration of the added value each component brings. Knowing their relative weighting in terms of client (and staff) outcomes could be important information when paired with cost considerations. It could also help to explain the absence of positive findings in a randomized controlled study conducted in a designated geriatric assessment unit (GAU) in Australia (Harris, Henschke, Popplewell et al. 1991). In this study, patients aged 70 and over admitted to the GAU were compared to those admitted to two general medical wards. There were no significant differences in outcomes between the three units. The GAU however, only had some of the elements of an ACE Unit. For example, while there was multi-disciplinary assessment, modification of the physical environment appears to have been less than in ACE Units.

Similarly, it may well be that there are settings in the Fraser Health region that have the “right” staff attitudes and practices but that lack the physical environment of a true ACE Unit or vice versa. Developing a “report card” for Geriatric units in acute hospitals in the region, in terms of how well they approximate ACE Units, might be an activity worth considering. This could be done as a self-study exercise by the units or by external sources. The important thing would be to construct a standard check-list or other tool that is used throughout the region. Amalgamation of data from the individual “report cards” would indicate where hospitals in the region are now and could serve as a baseline measure against which to evaluate the impact of any changes that are in future are made.

The philosophy and the activities engaged in by the Toronto East General Hospital Renovation Committee provide a model for what should happen at any hospital in this region for which a renovation is planned. They should also be part of the planning for any new construction. Specifically, at each site there needs to be a committee established which provides input to the senior administration and through them to the architecture and interior design team, which is educated as to the Environment and Aging literature and to the concepts of Universal Design. However, as Barnes (2002) notes in a recent article from the UK, much of the evidence supporting design guidelines for making health care facilities more seniors friendly is anecdotal and/or derives from traditional residential and nursing home settings.

Below is a beginning chart that cross-tabulates design elements with evidence considered in the Ulrich, Quan, Zimring et al.’s (2004) review to come from “rigorous studies”. One needed next step is to extend the chart – i.e. to identify studies completed subsequent to publication of the Ulrich, Quan, and Zimring et al.’s (2004) review which may provide evidence of design modifications that “work”. Another step is to determine if those conducted in chronic and long term care settings replicate when conducted among seniors in acute hospitals. And, to determine the extent to which extant design guidelines for seniors’ facilities in fact contain some directives that are universally beneficial. For example, glare may be a problem for people of all ages -- only more so for the aged because of physical changes to the eye. The design recommendations about

avoiding hard and shiny surfaces on floors, walls, and furnishings would appear at least on the surface to be a universal. There are likely many others. On the other hand, there are some we know that pit 'kids against canes'. For example, burners with controls at the back of a stove are recommended for households with young children. Stoves with front burner controls are recommended for older adults' homes (e.g. so that the occupant doesn't catch her dressing gown sleeve on fire as she reaches over the pot of oatmeal on the back burner to turn off the front one).

Design element	Reasons
Single-bed rooms	Provide privacy & increase patient disclosure of confidential information to health care providers; lower nosocomial infection rate; decrease patient transfers and associated medical errors; reduced noise; facilitate family visiting and provision of social support and assistance; increase satisfaction with overall quality of care.
Carpet	Reduce noise; increase social interaction
Colour coding, landmarks, directional signs before all major intersections, changes in flooring material	Reduce spatial disorientation
Non-slip flooring in bathroom, grab bars beside toilet and tub/ shower, hand-held shower and bath stool; high-mount toilet	Reduce falls
Bright light; placement of windows/east-facing orientation of building to allow exposure to morning light and to nature	Reduce depression & pain; shorter LOS
Garden/ representational nature art	Reduce agitation
Design ward layouts and nurses stations to reduce staff walking and fatigue	Increase staff time spent with patients
Beds without side rails	Reduce falls & injuries

Routine POEs of all renovations and new construction are also recommended. For example, Meissner, Andolsek, Mears et al. (1989) report that in designing a Geriatric Care Unit in a community hospital, it was assumed that patients would "do better" in shared rooms than in single rooms. It turned out however, that both patients and their families preferred private rooms. Other studies, as indicated in the chart above, have indicated that private rooms have lower nosocomial infection rates; decrease patient transfers and associated medical errors; have lower noise levels, etc. As Harris, Ross, McBride et al. (2002) note however, the size and shape of hospital rooms and other aspects of hospital interior design may have an impact on patient and staff satisfaction, yet little attention has been devoted to this in the literature. Reflecting the guest services/hospitality industry perspective, they also point out that much of the empirical research on hospital settings has focused on stress rather than satisfaction. This observation should be taken into account if POEs do become routine in the Fraser Health region, with greater

emphasis placed on determining satisfaction than has been the case in research conducted in other jurisdictions.

It will also be useful to conduct some studies on ways that recommendations from the 'Design for Dementia' literature can be applied to acute care hospital settings. In an article entitled "The role of the physical environment in the care of person's with Alzheimer's disease (Gutman, 1999) a number of examples are provided of ways the physical environment can be adapted to assist caregivers of persons with dementia in coping with "problem behaviours" such as agitation, wandering, elopement and trespassing – all of which may be exhibited by elderly persons with the dementia admitted to hospital. For example, it has been noted that patients with dementia often perceive two-dimensional objects as if they were three dimensional. Capitalizing on this visual dysgnosia, Hussian and Brown (1987) placed strips of masking tape on the dark brown floor in front of an opaque exit door to the Special Care Unit. Before installation of the strips, persons with Alzheimer's disease touched the door on 98% of approaches to it, rattling the handle, banging on it, etc. Only 30% of patients however, crossed an eight-horizontal-strip grid to touch the door. Other anecdotal evidence suggests that if there is a marked difference in the colour of floor coverings, for example, between a bedroom and hallway, unauthorized entry or exiting from the room may be noticeably reduced among persons with dementia.

Another activity is to incorporate elements of 'Design for Dementia' into public areas as well as Special Care Units and geriatric wards. Hospital staff on several occasions has expressed concern (Gutman, personal communication) that patients with dementia may leave the ward and wander into areas of the hospital that are dangerous. There was a dramatic case reported in the local newspapers (Grindlay, 2002) of an elderly man who left the Emergency department at Vancouver General Hospital and was located several days later, deceased, in a service area of the hospital. Perhaps such simple environmental design solutions as strips woven into the carpet in front of the door leading out from the Emergency department might have prevented this gentleman from exiting. Equipping hospitalized people with dementia with identification bracelets that have a transmitter embedded that will trigger door sensors when they attempt to leave an area is another example of a solution from the long term care sector than may be useful for acute care settings as well.

In conclusion, it should be recognized that there is wealth of information in the Environment and Aging literature about design elements and modifications that can make residential environments more senior friendly. There is a potential leadership role available to the Fraser Health region in taking the initiative to implement some of the recommendations in acute care settings and test their efficacy in terms of improving older adult's safety and quality of hospital life. The Simon Fraser University-BCIT Living Laboratory provides an ideal venue in which to do the preliminary work for such a project. Hospital bedrooms and other patient areas could be mocked up in the Living Lab and different configurations of the rooms and their furnishings (furniture and equipment), sound qualities, lighting, etc. could be systematically evaluated by having them tried out first, perhaps, by senior actors and later by 'real' but not ill frail elders. Designs and elements of the physical environment found promising could later be tested in an actual hospital environment with appropriate monitors and safeguards in place to ensure the safety and well-being of patients. The SFU Gerontology Research Centre would be very interested in partnering with Fraser Health in such an endeavor.

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