EXAMINING THE ROLE OF THE HOSPITAL IN SUSTAINABILITY
A CASE STUDY: CHANGI GENERAL HOSPITAL INTEGRATED BUILDING

Stephanie Costelloe, B+H Architects
Director of Healthcare, Asia
Managing Principal, Hong Kong
WHAT IS SUSTAINABILITY?
SUSTAINABILITY

“the quality of being able to continue over a period of time”
SUSTAINABILITY

“the quality of being able to continue over a period of time”

“the quality of causing little or no damage to the environment and therefore able to continue for a long time”
SUSTAINABILITY

“the quality of being able to continue over a period of time”

“the quality of causing little or no damage to the environment and therefore able to continue for a long time”

“meeting the needs of the present without compromising the ability of future generations to meet theirs”
WHAT IS THE ROLE OF THE HOSPITAL WHEN IT COMES TO SUSTAINABILITY?
SUSTAIN A HEALTHY POPULATION
Sustain a Healthy Population

Policy & Systems
- Sustainable Healthcare System
- Efficiency & Effectiveness
- Fiscal Sustainability

Design & Infrastructure
- Environmental Sustainability
- Social Sustainability
- Fiscal Sustainability
### BLOOMBERG HEALTHCARE EFFICIENCY RANKINGS 2015

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SINGAPOREANS ARE CONSIDERABLY HEALTHIER THAN AMERICANS, YET PAY, PER PERSON, ABOUT ONE-FIFTH OF WHAT AMERICANS PAY FOR THEIR HEALTHCARE.
“What's the reason for Singapore's success? It's not government spending. The state, using taxes, funds only about one-fourth of Singapore's total health costs. Individuals and their employers pay for the rest. In fact, the latest figures show that Singapore’s government spends only US$381 per capita on health—or one-seventh what the U.S. government spends.

Singapore's system requires individuals to take responsibility for their own health, and for much of their own spending on medical care.”

American Enterprise Institute, 2008
<table>
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<tr>
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<th>HONG KONG</th>
<th>U.K.</th>
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<td><strong>POPULATION</strong></td>
<td>7.4 MILLION (2017)</td>
<td>66 MILLION (2017)</td>
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<td>8.0 MILLION (PROJECTED 2041)</td>
<td>73 MILLION (PROJECTED 2041)</td>
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<td><strong>DENSITY</strong></td>
<td>6,765 people per sq.km</td>
<td>272 people per sq.km</td>
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<td><strong>BIRTH RATE</strong></td>
<td>1.1 per woman</td>
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<td><strong>AGEING</strong></td>
<td>12% WERE 65+ IN 2003</td>
<td>16% WERE 65+ IN 2007</td>
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<td>27% WILL BE 65+ IN 2033</td>
<td>23% WILL BE 65+ IN 2033</td>
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HONG KONG HAS A WELL-ESTABLISHED DUAL-TRACK HEALTHCARE SYSTEM (PUBLIC + PRIVATE)
“The public hospital system of Hong Kong provides a comprehensive range of quality services at a very low level of user charges, at a flat rate of about **US$13 per day** per bed, representing about 95% subsidies compared to the cost.”

Dr Ko Wing-man, Secretary for Food and Health, 2017
The public healthcare sector is heavily burdened:

- Hong Kong’s private healthcare is not affordable for a majority of residents
- 28,000 hospital beds in 42 public hospitals compared to 4,000 private beds (2015)
- Over 90% of inpatient services are provided by public hospitals
- Bed occupancy rates at most public hospitals is over 100%, and as high as 130% on a typical day in the busiest hospitals
- 13.6 million yearly attendances at public outpatient clinics (2014/15)
- Long waiting lists - a person with cataracts can expect to wait 162 weeks to see an eye specialist, whilst the waiting list for orthopaedic specialist can be up to 166 weeks
Environmental, societal and cultural factors also contribute:

- Underuse of primary care options and heavy reliance on hospital and A&E services, even for minor ailments
- Reluctance from clinicians to adopt ambulatory models of care leading to over-reliance on inpatient admissions
- Multi-generational households - family look after grandparents in the home
- Cultural sensitivities around death in the home impact bed occupancy rates
- Wellness culture (when it comes to hospitals) in its infancy compared to other countries
HONG KONG HEALTHCARE

Hong Kong’s health-care system is teetering on the brink. What’s wrong with it, what can be done to fix it and will the budget provide some answers?

Easing the overcrowding in Hong Kong’s public hospitals starts with an informed public

Public awareness plays a crucial role in increasing patients' knowledge about health and disease prevention. It reduces demand for hospital beds in the overstretched public sector.

How Hong Kong hospital overcrowding takes its toll on nurses, mentally and physically

Nurses in the city’s public hospitals are at high risk of stress and mental-health problems because of their workload. Many don’t seek help for fear of appearing weak.
HONG KONG HEALTHCARE

- In the 2015 Policy Address, the HK Government announced that it was committing a dedicated **HK$200 billion** towards implementing a 10-year Hospital Development Plan (2015-2025) to deliver 5,000 new hospital beds.

- An additional **HK$300 billion** was committed in 2019 for the period 2025-2035, totaling **HK$500 billion (GBP50 billion)** in capital expenditure over 20 years.

- In 2018/19, the HA was provided with a 10-year high recurrent funding of $61.5 billion, representing 15% of the government recurrent expenditure. (Recurrent funding in 2003/04 was HK$28b.)
Sustain a Healthy Population

Policy & Systems
- Sustainable Healthcare System
- Efficiency & Effectiveness
- Fiscal Sustainability

Design & Infrastructure
- Environmental Sustainability
- Social Sustainability
- Fiscal Sustainability
SUSTAIN A HEALTHY POPULATION

POLICY & SYSTEMS
- SUSTAINABLE HEALTHCARE SYSTEM
- EFFICIENCY & EFFECTIVENESS
- FISCAL SUSTAINABILITY

DESIGN & INFRASTRUCTURE
- ENVIRONMENTAL SUSTAINABILITY
- SOCIAL SUSTAINABILITY
- FISCAL SUSTAINABILITY
ENVIRONMENTAL SUSTAINABILITY
Healthcare facilities, as a rule, are some of the most energy-intensive buildings in the commercial sector. According to the U.S. Department of Energy, hospitals are 2.5 times more energy-intensive than other commercial building types.
How can healthcare buildings give back more than they take?

Create a low or nil negative impact on the environment; energy consumption, water usage, waste production, material selection.
ECONOMIC SUSTAINABILITY
Agile & support future change at low cost

Buildings are flexible and adaptable to their future needs and uses without significant cost, improve the financial situation of the client, and promote economic success in the wider community.
SUSTAINABILITY

THE HUMAN ECOSYSTEM

People are at the centre of sustainable and healthy design.
Social sustainability is defined as:

"a process for creating sustainable, successful places that promote wellbeing, by understanding what people need from the places they live and work."

Social Life, a social enterprise specialising in place-based innovation

Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life.”

Western Australia Council of Social Services
HOSPITAL DERIVED FROM THE LATIN WORD ‘HOSPES’ — SIGNIFYING A STRANGER OR FOREIGNER, HENCE A GUEST

Another noun derived from this, ‘hospitium’, came to signify hospitality – the relation between guest and shelterer

Hospitality, friendliness, shelter, hospitable reception
Elevate the ‘guest’ experience

How would be the impact to society if we thought of hospital stays in the same way as hotel stays

Leisure, relaxation, respite, wellness, comfort, feeling of being ‘cared for’
Human spaces where social interactions occur (not just functions)

Art, colour, life, vibrancy
Social Sustainability

Authentic and meaningful spaces that people want to inhabit and enjoy

Daylight, views, amenity, comfort, choice, reassurance
Staff wellness: work, play, learn

Design of healthcare facilities has the ability to influence the attraction and retention of staff and have a positive impact on workforce trends.
Patient centric hospitals extending into communities

Patients are not isolated but integrated, and better able to return to their communities and be independent contributors to society.
“Frequently dubbed health districts or health villages, the concept of a healthcare component serving as a community anchor that influences an overall wellness-focused lifestyle is picking up plenty of steam.”

Healthcare Design Magazine, 2014
CHANGI GENERAL HOSPITAL

BACKGROUND

• 1,000 bed regional public hospital located in Simei, eastern Singapore, founded in 1998

• Comprehensive range of services from general surgery, cardiology and ENT to orthopaedics and sports medicine in addition to 6 specialist centres

• In 2005, CGH became the first acute care hospital to integrate with a community hospital – St Andrew’s Community Hospital
CHANGI GENERAL HOSPITAL

DESIGN CHALLENGE

- Existing building dating from the 90’s serves as an acute care unit (including A&E and inpatients), outpatient medical clinics, and staff administration building

- Patients who require rehabilitation - especially the growing elderly population - were being kept in acute care for as long as two months

- Great financial stress and operational burdens on the healthcare system
CHANGI GENERAL HOSPITAL

REDEVELOPMENT PROJECT

- Intensify the existing hospital campus whilst maintaining full operation of all clinical services

- Addition of 2 new buildings:
  - Integrated Building
  - Medical Centre

- >60,000 m² new build area

- Final stage of redevelopment involves re-modelling existing hospital building
MASTERPLAN OBJECTIVES

“A sustainable, regenerative healthcare campus with nature as a focus”

- An integrated patient-centric model, operating across the full spectrum of patient needs
- Seamless integration of care for an aging population
- Clarity of functions and flows - segregated circulation
- Optimize operational efficiencies
- Long-term thinking: future-proofing, whole of life costs
- Flexibility and adaptability
- Naturally ventilated wards
- Green mark platinum
EXISTING HOSPITAL
STAYS FULLY OPERATIONAL
S1: Integrated Building
Rehabilitation

Existing Hospital
Stays Fully Operational
A SUSTAINABLE HEALTHCARE CAMPUS
FINAL MASTERPLAN

INTEGRATED BUILDING
COMPLETED IN 2014

RE-MODELLING
COMMENCING 2019

MEDICAL CENTRE
COMPLETED IN 2018
ENVIROSMENTAL SUSTAINABILITY

Certified Green Mark Platinum

- Incorporation of a Cool Roof and Green Roof
- Extensive Greenery with Green Plot Ratio of 5
- Zero Percent Run-Off Grey Water Collection
- 4,432,517.14 kWh/yr annual energy savings
- 0.574 kW/ton Chilled Water Plant Design System Efficiency
- 2100 tons of CO2 reduction annually
- 35 kWp of PV Cells installation
- Efficient lighting and daylight control
  - Motion sensor for toilet and staircases
  - Photo sensor for daylit areas
ENVIRONMENTAL SUSTAINABILITY

LEVEL 4 PLAN

LEVEL 5-7 PLAN
THE ECONOMICS OF GREEN BUILDING

Realized significant operational savings through sustainable building strategies

- 73.2% of units achieved Natural Ventilation Requirement
- 0.574 kW/ton Chilled Water Plant Design System Efficiency
- 31.07% of Total Building Energy Savings
- Hot Water generation using recovered heat from return chilled water
- 100% use of non-potable water for irrigation
- Extensive use of Sustainable Construction Materials
‘SOCIAL’ OBJECTIVES

With an ageing and growing population, the number of patients with disabling conditions such as stroke and hip fracture is expected to increase substantially. At the same time, family and household sizes are getting smaller. As a result the number of elderly patients living alone or with an ageing caregiver will increase.

It is thus crucial to enable patients to live independently and be able to work productively for as long as possible.

“Our model of care must evolve to help patients reach their highest rehabilitation potential and independence. We need to empower patients to be active participants in their own recovery so that they can live independently with a good quality of life as much as possible.”

Dr Lee Chien Earn, CEO of CGH
‘SOCIAL’ OBJECTIVES

- New integrated building that could accommodate long-term, elderly patients, and help integrate them back into the community, both physically and socially
- Innovative age-friendly design to support aging-in-place
- Emphasis on rehabilitation to facilitate patient transition back to the community
- Incorporation of family and carers into every step of the patient care process
PATIENT BEDROOM
PATIENT BEDROOM
'THE HOUSE'

- From 6 bed room to 10 bed 'house'
- Patient beds are staggered, ample room for bedside rehab
- Front porch and back garden
- Garden is embedded into the room
- Encourages social interaction between patients, and incorporates family and carers
'THE NEIGHBOURHOOD'

- House to neighbourhood module
- Arranged in 2 clusters
- Shared social spaces
**THE NEIGHBOURHOOD**

**ENTRY**
1. Lift Lobby / Entry
2. Reception

**WARD AREA**
3. 10 Bed House
4. Private Garden
5. Semi-private lounge

**SOCIAL HUB**
6. Family / Dining Area
7. Shared Terrace

**STAFF**
8. Staff Support Hub
SOCIAL SUSTAINABILITY

Reintegrate recovering elderly patients back into their community and independent lifestyles

1. Rehabilitation therapy begins at the bedside
2. Patient moves to semi-private zones close to bedside
3. Patient moves to the semi-public zones at ward level
4. Patient rehab activities move to public rehabilitation areas
5. Patient moves to a simulated independent living unit
6. Continuing rehabilitation in outpatient / community setting
A HEALTHCARE CAMPUS FOR THE COMMUNITY

1. CGH Acute Hospital
2. Medical Centre
3. IB Building
4. Simei Care Centre & St. Andrew's Community Hospital
5. Orange Valley Nursing Home
6. Urban Tree Line Streetscape
7. Arrival & Drop-Offs
8. Reception
9. Water Garden
10. Outdoor Cafe
11. Tree Clusters with Seating Edge
12. Village Plaza
13. Fish Pond & Flowering Tree Pods
14. Retail Kiosk
15. IB Plaza
A HEALTHCARE CAMPUS FOR THE COMMUNITY

Covered all-weather walkways connect the whole campus

Ample green area

Community seating and social spaces

Incorporation of retail components to activate public areas
HOSPITAL AS A LIVING ORGANISM
HOSPITAL AS A COMMUNITY HUB

The contemporary hospital’s place in our communities reaches past the confines of single-use, isolated institutions with finite lifespans.

Hospitals are rapidly evolving into place-based, mixed-use facilities embedded into their environmental and social ecosystems, possessing both the opportunity and the responsibility to become community hubs for sustainable living.
THANK YOU