Size vs. Performance

Trajectory of healthcare delivery against modernisms

Origins of Healthcare Infrastructure

Historically hospitals were first developed for reception of wayfarers, pilgrims and the infirm. As such it is important to appreciate that the etymology of <u>hospital</u>, <u>hospice</u>, <u>hostel</u> and <u>hotel</u> is in the Latin word "hospitum" which means lodging or a guest.

A large proportion of these hospitals were attached to monasteries or covenants who saw their role as affording hospitality to those in need.

Sick and poor people were admitted mainly for shelter, basic nursing care and isolation. Crowding and cross infections produced high death rates and thereby created a negative image of hospitals as gateways to death.

Development of medical sciences provided significant transformation of hospitals from these incoherent hostel-like institutions to components of a broader, scientific and integrated healthcare system.

Current Healthcare Infrastructure Challenges

The current system is under pressure to improve its healthcare delivery processes and in so doing improve its efficiency, effectiveness and sustainability.

The healthcare infrastructure has been designed in an inflexible clinician-centred manner thereby making it vulnerable to silos and inefficiencies. As a result, Dutch architectural historian Cor Wagenaar has portrayed many hospitals as institutional complexes that are:

- Built catastrophes,
- Run by vast bureaucracies, and
- Unfit for the intended purpose.

Solutions to the Challenges

New infrastructure design values including "form-follows-function" and "evidence-based-design" are now being adopted for development of sustainable, flexible, adaptable and integrated healthcare infrastructure.

These values advocate for a bigger influence of measureable factors on determining the need, location, size and form of healthcare delivery infrastructure. These factors include epidemiology, allocative efficiency, accessibility and equity.

Resonating to the above values has been the progression of healthcare delivery from clinician-centred system design to people-centred system design.

Future Influence of Technologies to Healthcare Delivery

Technologies are becoming more cohesive, smaller, mobile and affordable. The healthcare industry has experienced a proliferation of innovations in biotechnologies, medical devices, information and communication technologies (ICTs), pharmacology, and process automations.

Analysis of future technology trajectories and their effects on healthcare delivery processes is necessary for development of infrastructure that is flexible and sustainable.

The outlook of future healthcare delivery is towards preventative and ambulatory care. Socio-economic factors and technology innovations are envisaged to be the drivers for this future trend.

Biotechnology

In general biotechnology is any technology application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use. Breakthroughs in biotechnology and associated fields has revolutionised the practice of medicine with the development of:

- Simpler tests for more accurate diagnosis of diseases;
- Genetic and proteomic tests that allow for prevention of diseases;
- More efficient methodologies for designing and making drugs that are targeted at molecular level therefore conceivably more effective but less toxic; and
- Possible gene therapy to cure diseases that are incurable.

Information and Communication Technologies

Rapid advancements in ICT have provided solutions to various healthcare delivery challenges including

- Digital Appointment Systems that enable appointments to be made from remote sites;
- Patient Queuing and Sorting Systems;
- Easily retrievable Electronic Patient Record Systems; and
- Telehealth..

ICT plays a pivotal role in enabling advancements in other technological segments and in improving healthcare delivery processes. This includes telemedicine, medical imaging and adoption of smartphones in healthcare delivery.

Emergence of software applications has made smartphones useful tools in the practice of evidence-based medicine including at the point of care.

Convergence of Technologies

In healthcare converging technologies refers to the synergistic combination of nanotechnology and biotechnology (nanobiotechnology), information and communication technology, and cognitive sciences.

Only probe, display on mobile phone
Wireless, convention for use
4D Scan, more accurate

Convergence of Technologies

Nanotechnology has materialised a new science and technology field called nanomedicine which pertains to the diagnosis, treatment and prevention of diseases using molecular tools and molecular knowledge of the human body. Nanomedicine includes several distinct application areas including:

- Drug delivery,
- Drugs and therapies,
- In vivo imaging,
- In vitro diagnostics,
- Biomaterials, and
- Active implants.

Nanotechnology is envisaged to lead advances in ICT, biotechnology and medical devices as it continues to cross-pollinate and converge with these fields. What nanomedicine will achieve in future is beyond current imagination, but it is certain that the future will introduce new nanomedical techniques with new healthcare delivery processes.

Future Healthcare Delivery

Digital diagnostics and therapy, cloud data storage and retrieval, ultra-fast scans, and wearable devices are indicating for future hospitals that are:

- Flexible in design,
- Outpatients focused, and
- More integrated at many levels.

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Future Healthcare Delivery

Converged technologies may also enable collaboration amongst networks of healthcare providers, where services may be remotely accessed by communities. Technology has emerged as an important aspect that influences both healthcare delivery processes and infrastructure planning.

Quantification of the impact and timelines of technology innovations are almost impossible but we need to be astute in our knowledge of synergies in:

- Healthcare delivery processes,
- Healthcare technologies, and
- Built infrastructure.

Are _we_ Heading to the Right Direction?

- Knee-jerk reactions

- Fire Fighting

- Political influence

- Perceived need

- White Elephants

- Strategic Goals

- Needs Analysis (holistic)

- Technology Assessment

- Affordability (TCO)

- Value for Money

- Acceptance