

HEALTH TECHNOLOGY MANAGEMENT

NEW PARADIGMS

S.RAMNATH, ECRI MIDDLE EAST



Health Technology Growth

- ▶ Most medical advancements & capabilities are embodied in & enabled by new technologies
- ▶ New technology is the primary driver of increased system & facility complexity & healthcare costs
- ▶ Increased costs include specialized personnel, training, special supplies, maintenance & service, software & upgrades & healthcare facility space & modifications, not just hardware

Healthcare Technology Definitions

- ▶ Drugs
- ▶ Devices & Equipment
- ▶ Biotechnologies
- ▶ Medical & Surgical Procedures
- ▶ Related Information Technology including Communications Systems

How Large is the Challenge?

Review of ECRI's comprehensive *Forecast & Target* databases on emerging healthcare technologies suggests that approximately 10-15% of 250 technologies are likely to impact hospital design, space allocation or require renovation of space or some modification of building systems. Few of these technologies were anticipated by practicing physicians five years ago.

Drugs

- ▶ Reduce frequency of patient admissions
- ▶ May increase length-of-stay of individual inpatients because of adverse reactions
- ▶ Increase frequency of outpatient visits
- ▶ Reduce frequency of surgical procedures
- ▶ Increase home & self-care
- ▶ Increase need for information technology

Examples

- ▶ Antihypertensive drugs have reduced the incidence of strokes & related hospitalizations
- ▶ Antipsychotic drugs have reduced the need for inpatient psychiatric care & associated bed complement
- ▶ Antibiotics for gastric ulcers have reduced frequency of hospitalization & length-of-stay
- ▶ Lipitor & similar drugs may reduce cardiac cath lab utilization in the future

Example

Replacement of explosive or flammable anesthetics such as ether & cyclopropane by newer compounds eliminated the need for anti-static measures in the operating theatre such as conductive floors, shoes & booties; conductivity testers, isolation transformers & line isolation monitors

Single Use Medical Devices

- ▶ Increase warehousing space requirements, truck traffic & unloading frequency
- ▶ Increase solid waste disposal & waste streaming requirements, which impacts space demands for collection, separation, processing, containment, chlorinator-pulverizers, incinerators, environmental control systems & waste trucking

Examples

- ▶ High bulk single use products include dialyzers & oxygenators
- ▶ Medium bulk but high usage volume products include infusion pump cassettes, intravenous administration sets, solution bags
- ▶ Low bulk high volume usage products include syringes & blood collection tubes

Single-Use Products

- ▶ While most non-implantable single-use products are polymer based, they often contain glass, metal & rubber components.
- ▶ Most such used products are considered infectious waste & must be separated, steam-sterilized & processed accordingly

Medical Equipment

Speed of innovation creates frequent demand for additional space in existing clinical units and new types of clinical units with special requirements for access, structure, space, shielding, electrical power, heating, ventilating & air conditioning (HVAC), plumbing, access controls, materials, materials handling, communications & associated facilities for additional personnel

Examples

- ▶ MRI's have imposed a wide range of stringent design requirements, some of which had not been previously encountered, such as a demand for non-ferrous materials & access controls
- ▶ New surgical technologies have increased individual operating theatre space requirements by 50% over the past three decades. The old standard of 400 square feet has increased to 600 and sometimes more for specialized theatres, despite ceiling pedestals. Robotics may increase demand

Biotechnologies

- ▶ Biotechnologies are likely to have contradictory effects; Some will diminish the need for hospitalization & others require it.
- ▶ In the short term biotechnologies may increase space requirements for laboratories, clinical research & associated care areas
- ▶ The overall impact is likely to be small

Medical & Surgical Procedures

- ▶ Transplantation
- ▶ Endoscopic surgery
- ▶ Electrophysiology

Examples

- ▶ Bone marrow transplantation requires a new clinical unit with associated space needs and isolation and infection control requirements
- ▶ Shift to endoscopic surgery may justify dedicated operating theatres, some associated with outpatients or short term admissions

Convergence

New surgical and imaging modalities have led to more interventional procedures being done in imaging suites and more imaging being done in operating theatres. More of both, interventional procedures and imaging, are being done in emergency care and outpatient facilities.

Examples

Electrophysiology procedures, (e.g. radio-frequency ablation, pacemaker programming) may be undertaken in cardiac catheterization laboratories or operating theatres or require new dedicated space.

Information Technology

- ▶ Picture archiving systems can eliminate imaging department and off-site film storage filing rooms & reduce associated personnel needs
- ▶ Patient information systems, including images, require power & network connections, displays and keyboard & input devices at each bedside, at nursing stations, in operating theatres, treatment rooms, physician offices, pharmacies, etc.
- ▶ Classical computer rooms are giving way to small server rooms with reduced cable, HVAC & electrical demands

Example

A 600 bed hospital with an extensive outpatient load can be supported by an integrated hospital information system (HIS) that requires only a pair of mirrored servers, each with only one small UPS & taking the floor space of several standard desks. HVAC demands are less stringent than for classical computer rooms and BTU load is relatively low

Non-Medical Technical Advancements Impacting Health Facility Design

- ▶ Knowledge management & educational technology
- ▶ Security systems
- ▶ Wireless communication
- ▶ HVAC options e.g. water-source heat pumps employing earth loops & wells

Knowledge Management & Education Technology

Knowledge management & educational capabilities for both staff & patients, (like hospital information systems, telemedicine & other communications), are increasingly dependent on broadband internet access throughout a healthcare facility. Virtually every office, nurses station, diagnostic suite, operating theatre and bedside must be linked.

Security Systems

Security technology, in an increasingly dangerous world, will have a significant impact on hospital & emergency care facility design, traffic management and external & internal access controls. The paradox is that good healthcare demands free & easy access & even moderate security demands controlled access. A further paradox is that safety requires unhampered egress but that both security & safety also require controlled egress.

Wireless Communication

Regardless of the promise of wireless networks for everything, such systems are not yet ripe and electromagnetic interference in technologically intensive environments is common. It would be wise to include cable & fiber-optic troughs, chases & distribution closets in new hospital design and major renovations

New Business Models Impacting Hospital Design

- ▶ Diversification
- ▶ Continuity of care
- ▶ Outsourcing

Conclusions (1)

- ▶ Drugs have the greatest impact in diminishing inpatient census & bed requirements
- ▶ New technology supported medical & surgical procedures have the greatest impact in increasing inpatient census
- ▶ New medical equipment has the greatest impact on design of imaging departments, operating theatres, clinical laboratories

Conclusions (2)

While medical innovation has accelerated, clinical trial challenges, regulatory approvals, the demands for evidence-based medicine & budgets & bureaucracy retard rapid adoption of new healthcare technologies. The proving period leading to adoption of a new technology often exceeds a typical hospital development and construction project

Conclusions (3)

- ▶ It is important to keep up with medical advancements & their design implications independently of, but in collaboration with, physicians
- ▶ The future is unpredictable and therefore it is important to design for flexibility & growth.
- ▶ An uncertain world makes it important to design for improved security.

Thank You



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