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Tele-health in theory versus practice: a comparative look at the United States and Singapore

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Global Health Challenges

- Annual health care expenditures in the United State totaled some $3.6 trillion dollars at the end of 2018 (17.9% of GDP), estimated to reach $5.7 trillion dollars by 2026
- Health care expenditures for developed economies range from 8% to 15% with 74% financed from public sources
- Global shortage of clinical staff
- Increase in life expectancy and rapid growth of elderly population. Each additional year of life increases health care costs by 3%
- Telehealth offers potential to engender better and more extensive access to health care at lower costs

Addressing the Digital Divide

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Focus of Paper

What is the value proposition for e-health and can it alleviate the health care problem?

What are the obstacles and challenges to adoption?

How has the COVID-19 pandemic provided a conduit to bridge the gap between theory and practice? Does Singapore's model provide lessons for other healthcare systems?

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Definitions

Telemedicine: use of telecommunications and computer technologies with medical expertise to facilitate health care delivery

e-health: incorporates remote sensing, collaborative patient care and access to electronic libraries and medical databases

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Value Proposition

Effective when geography, distance terrain, climate or other physical barriers has prevented or hindered direct contact between patient and clinician

Savings can be achieved from the reduced costs of patient care, in the US health and other national health systems through:

1. better chronic disease management; COPD, CHF, diabetes, hypertension
2. reduction in both travel and time for patients and doctors;
3. provision of better health care & cost reductions from increased monitoring & early diagnosis

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Chronic Disease Management

Value Proposition

HealthPAL

Enables monitoring of health conditions e.g. high blood pressure

- *hypertension can lead to coronary heart disease, apoplexy and nephropathy*
- *45% of hypertension patients die from cardiovascular disease*
- allows “aging in place”

  95% of older adults surveyed prefer to live in their own homes as long as possible

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Chronic Disease Management

Value Proposition

- 51% of adults with chronic diseases go online
- top 4 chronic diseases collectively cost $969 billion and affect over 152 million Americans per year

Illness Categories	Device or Peripherals
Cardiology, such as hypertension, CHF and stroke	Blood pressure monitor, weight scale, digital electronic stethoscope
Respiratory disease, such as asthma, and COPD	Peak flow meter, monitor, weight scale, digital stethoscope, digital spirometer
Diabetes and wellness	Blood glucose monitor, weight scale
Post-acute recovery, such as wound care, post-surgical and organ transplant	Video camera or image-capturing devices
Mental health, such as chronic depression and schizophrenia	Video camera for live interactive sessions

Source: Pew Internet and American Life Project (various years), Advanced Medical Technology Association

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Chronic Disease Management

Value Proposition

Diabetes: appropriate disease management is critical

Pennsylvania Tele-home Project (171 patients)

Traditional Care Per patient $232, 872	Remote Monitoring Care per patient $87,327	Savings/Patient $145, 500

Estimated 9% of 1.5 million persons in U.S. state and federal prisons

- improvements in glycemic, blood pressure and lipid control with tele-visits

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E-health

Value Proposition

Cost of Inpatient Care (per patient per month) Compared to Home Care for Select Conditions			
Conditions	Hospital Costs	Home Care Costs	Dollar savings
Low birth weight	$26,190	$330	$25,860
Ventilator-dependent adults	$21,570	$7,050	$14,520
Oxygen-dependent children	$12,090	$5,250	$6,840
Chemotherapy for children with cancer	$68,870	$55,950	$13,920
Congestive heart failure in the elderly	$1,758	$1,605	$153
Intravenous antibiotic therapy for cellulitis, Osteomyelitis, others	$12,510	$4,650	$7,860

Source: National Association of Home Care & Hospice, 2010

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E-health

Value Proposition

Changi Hospital Heart Failure Telehealth program in Singapore

- *Total cost of heart failure-related care for each patient dropped by 42%* (S$2,514)
- *Length of stay for heart failure related readmissions shortened by 67% (2.2 days vs 6.7 days)*
- 93% of the respondents in the telemonitoring group felt that they were more involved in their own care

Source: https://www.philips.com.sg/a-w/about/news/archive/standard/news/press/2018/20180125-telehealth-program-by-changi-general-hospital-and-philips-empowers-heart-failure-patients.html

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Value Proposition

Tele-ophthalmology and Diabetic Retinopathy in Singapore

Telemedicine-based diabetic retinopathy screening model had significantly lower costs (total cost savings of S$173 per person) while generating similar quality-adjusted life-years compared with the physician-based model

From a health system perspective that includes only direct medical costs savings are S$144 per person

Present value of future cost savings associated with the telemedicine-based model is estimated to be S$21.6 million over the lifetime of estimated 170K patients screened

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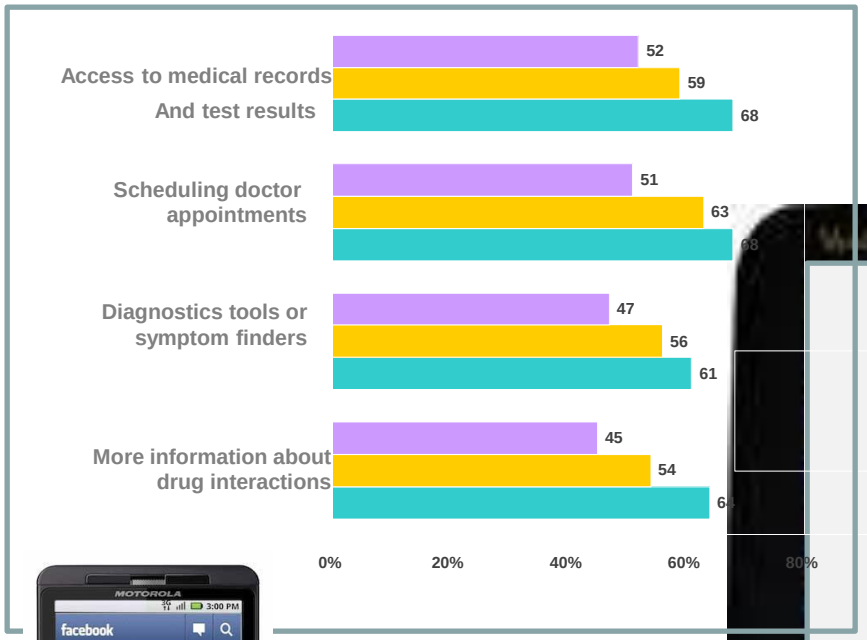
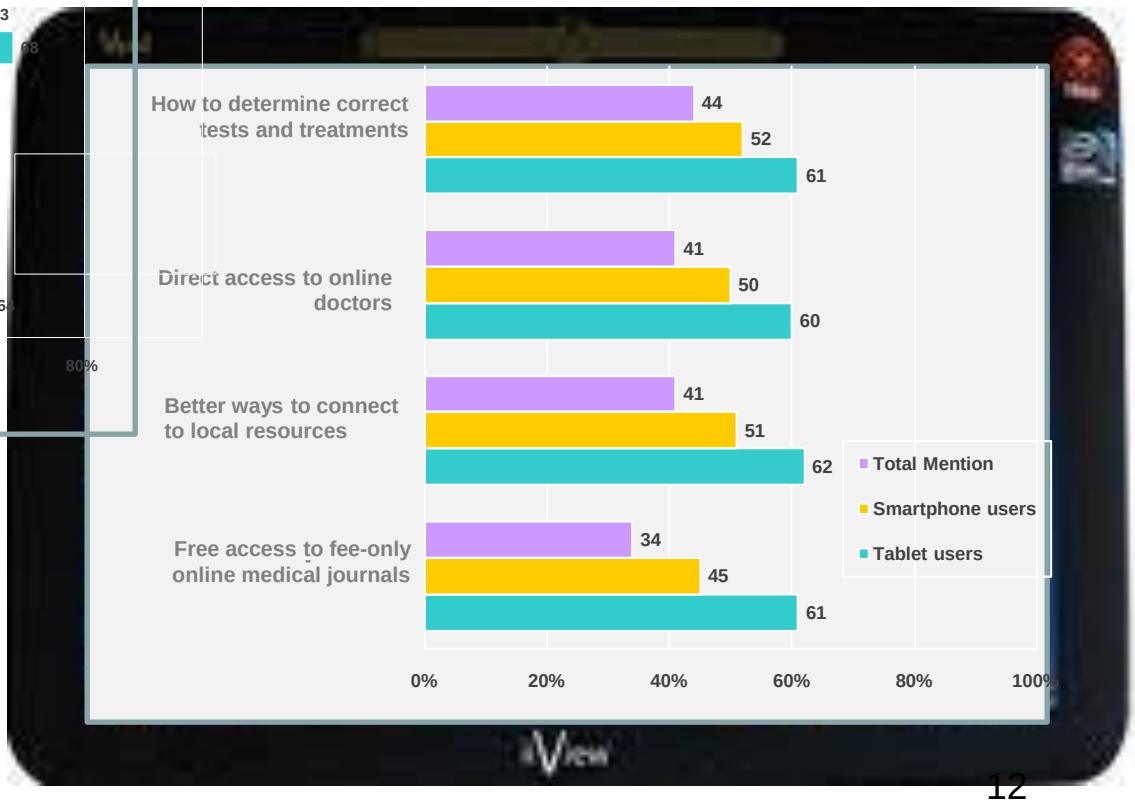
E-health

Value Proposition

US cell phone users are receptive to m-health services





Question: How valuable are the following aspects of healthcare to you?

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E-health

Value Proposition

- From a patient's perspective, several studies suggest general satisfaction with tele-health and digital home health services, even among older adults
- Early adopters have fully embraced the use of the Internet to improve their individual health-care management.
- Studies show that e-health is valued across all demographic groups. Home-monitoring applications provide large potential market
- Smart phone as access platform provides a familiar means of access

Interface Issues

Challenges

- Ease of use of devices and equipment still present problems for the "average" physician
- Interface devices generally have low compatibility to existing medical practices – health care professionals must "adapt" to the devices and not vice-versa
- Interoperability issues still exist across devices, software and protocols
- Devices and applications must be able to accommodate patients' differing physical capabilities
- Home-based interfaces still need to be developed

E-health

Delivery Platform

Challenges

- Ease of use of devices and equipment still present some problems for the “average” physician
- Interface devices generally have low compatibility to existing medical practices – health care professionals must “adapt” to the devices, not vice-versa
- Home-based interfaces still need to be developed

Organizing Structure and Eco-system

Challenges

- Multiple Federal regulatory agencies, up to twelve, have oversight on specific aspects (DEA, FDA, FCC, etc.) of home-health
- States regulate health related issues within own borders. Multiple and different legal definitions between states
- Telemedicine defined as “bringing doctor to the patient” as opposed to “patient to the doctor”
- Technical complexity in delivery of e-health services requires active participation of network service providers. Network service providers also offer the advantage of being able to set and/or establish standards and protocols
- Formal partnerships are a pre-requisite with anchor player taking the lead

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Organizing Structure and Eco-system

Overcoming the Challenges

Mental health conditions (MHCs) affect 44.7 million adults in the U.S. and it is reported that one in five adults experience an MHC in a given year

A large retrospective case study found that adoption of Tele-Mental Health was significantly lower than general tele-health in acute care hospitals. However, adoption was significantly higher in the following instances:

i) Veteran Administration Medical Centers (VAMCs) and facilities

ii) Facilities treating patients insured by Medicare, VHA, and private payers. Facilities treating elderly patients were more likely to have TMH than those who did not

iii) States with a higher percentage of rural counties. Higher telehealth/TMH adoption in rural areas might be a result of financial incentives provided by federal and foundation funding

iv) Mental health facilities located in states that had a special application process for licensure for providing interstate tele-health services (twice as likely to have TMH than those in states without specific licensure requirements)

E-health

Cost Structure

Challenges

- Current cost-benefit studies are limited in scope
- Most studies are small and involve samples of between 30 to 450
- Need for comprehensive and extensive studies of savings to patients/health care providers due to early detection of diseases as well as health maintenance
- Reimbursement by Medicare has been extremely limited
- New comprehensive revenue and payments models need to be developed

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Tele-health in the U.S During the SARS-CoV-2 Pandemic

Currently no reported widespread deployment of tele-health in the U.S.

Center for Disease Control found that **during the first quarter of 2020, the number of tele-health visits increased by 50%,** compared with the same period in 2019, with a 154% increase in visits noted in surveillance week 13 in 2020, compared with the same period in 2019

During Jan–March 2020, most encounters were for conditions other than COVID-19

Proportion of COVID-19–related encounters significantly increased (from 5.5% to 16.2% during the last 3 weeks of March 2020--surveillance weeks 11–13)

Tele-health in Singapore prior to COVID-19

- Telemedicine was employed for review of consult cases which were stable, where physical checks and tests were not required, and where patients had access to the appropriate devices and connectivity
- Initial pilots were for disciplines such as mental health, renal medicine, pharmacy, epilepsy, and dementia
- Only 1,947 patients used the service between 2017 and early 2020

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Tele-health in Singapore: responding

Nephrology Division of the National University Hospital (NUH) with a 1,160-bed tertiary hospital serving more than 670,000 outpatients and 49,000 inpatients a year – in 10 days moved to online health delivery

In November 2018, National Kidney Foundation established an electronic medical record (EMR) for each HD patient, with integrated computerized physician order entry and task management tools

February 7, 2020: in-person dialysis rounds were ceased and one day later, replaced by remote review of dialysis treatment records and telephone discussion with dialysis nurses for all patients

Seven nephrologists perform monthly rounds on 960 HD patients across seven satellite community dialysis centers (DCs). Frequent in-person rounds at DCs were mandatory before the pandemic.

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Tele-health in Singapore: Responding

NUH found success in overall outcomes and patient satisfaction with the rapid adoption of telemedicine

Key biochemical performance indicators had been unaltered by reduced physician presence

No significant difference in hospital admission rates for cardiovascular disease or vascular access complications

Informal survey of patients at one DC found that most expressed satisfaction with experience

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Two Precursors Enabling Service Delivery Platform

In 2014, Singapore launched the Smart Nation Program, designed to harness ICT, networks and data to improve the quality of life, strengthen businesses, and help government agencies serve citizens better, particularly in the face of increasing urban density and an aging population

In 2004 Singapore's 10-year Intelligent Nation masterplan (iN2015) led to development of the Infocomm infrastructure to support the Internet of Things (IoT) and to enable cyber physical systems (CPS)

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Conclusions

Prospects for Tele-health

- Tele-health is not seen as means to replace “physician-patient” contact. Applications designed to support and enhance “face-to-face” contact have yet to be fully developed
- Rising health costs, aging population and shortage of clinical staff are accelerators to adoption
- End-user surveys suggest cost and time savings from reduced hospital admissions, emergency department and medical practitioner visits and reduced travel costs
- Inclusion of non-traditional stake-holders and anchor players is necessary – in Singapore it is the government

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Thank You

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