# The Evolution of Telemedicine and Artificial Intelligence: A Comparison of Two Systems

Presented by Dr. Steven Stumpf, Part-time Faculty, Dr. Louis Rubino, Professor and Dr. Donghai Wei, Adjunct Faculty
California State University, Northridge

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Telemedicine/AI/Innovative Technologies

- Initial forms of telemedicine involving transfer of images depended on high-capacity fiber cable and large capacity data storage.

- Today all medicine operates through the **"cloud" via server farms**.

- Immense metal racks of patient charts have been replaced by digital formats.

- The AI model is simple using mobile devices and analytics.

- AI includes (i) digital images that can be interpreted diagnostically; (ii) diagnostic analysis based on digital databases; and (iii) cross tabulations that continually update data banks with data for immediate diagnostics.

- A wearable device collects heart rate which uploads to a mobile phone which uploads to the cloud for machine interpretation.

- Results are downloaded to provider and patient.
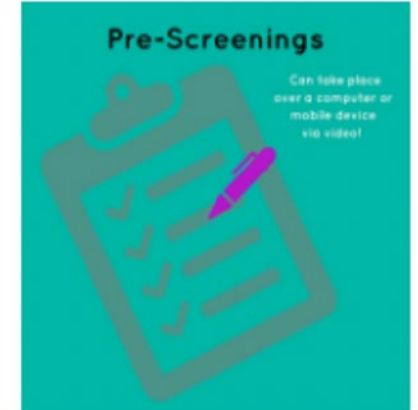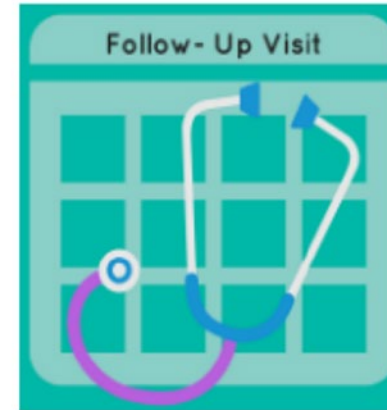
BENEFITS OF THE PANDEMIC FOR TELEMEDICINE

Telemedicine is ordinary today. As the generation of family practice physicians trained in the 1960s and 70s retires the penetration of digital formats that store, compile and analyze patient information will be complete.

A snapshot of telehealth trends

38x Telehealth utilization has stabilized at levels 38 times higher than before the pandemic.

57% of providers view telehealth more favorably than before COVID-19 and 64% are more comfortable using it.

50% Telehealth uptake varies by specialty, with the highest penetration in psychiatry.

Source: Telehealth: "A quarter-trillion-dollar post-COVID-19 reality?" McKinsey & Company, July 9, 2021

Artificial Intelligence

SMART CLOTHING

- AI is triumph of "remote" medicine; the majority of primary care will occur virtually. **"Bots"** will handle the most routine tasks including "check-in," payment and post-visit reports.

- What to expect in the near term? Huge increase in **"wearables"** already in place with smart watches. Expect "smarter" clothing that can read blood pressure, glucose, heart rate, location in case of an "event."

- VR is immersive, a completely computer generated environment. Application in healthcare especially useful for clinical training. Consider medical school students have minimal patient contact before their residency. With VR the pre-doctors can get some exposure to patient contact in a video setting. Treatment for fear of spiders. Patient immersed in spiders.

- AR adds computer generated information to the real word. A 3D image of a patient's organ appears "outside the patient." Vein scan for drawing blood.

- Other major healthcare applications:
    - Precision medicine = targeted interventions for specific diseases
    - Nanobots released into the organism for gene therapy and microsurgeries
    - Personal medicine = improved individual health and minimal intervention for personal care.
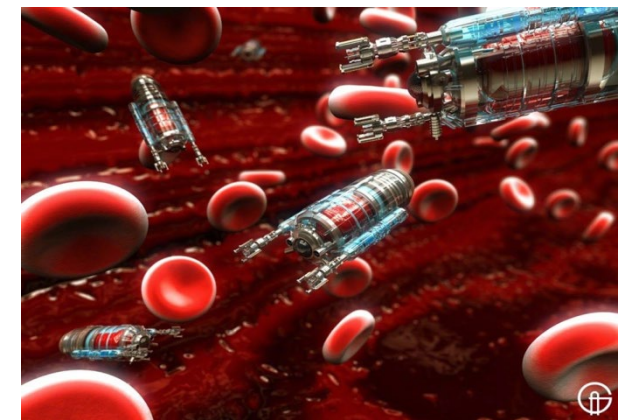
Impacts population and personal health.

Comparison to China

- Health system differences
  - Large dependency on large government hospitals
  - Challenged by gatekeeper concept
  - Physician education improvements
  - Payment mechanism changing

- Guangdong Second Provincial General Hospital (1500 beds)
  - From Internet + ➡ Smart Hospital ➡ 5G Powered Medical Center (use AI, cloud storage, IoT)
  - Medical consultation facilities equipped with telemedicine connected to hospital
  - Data obtained from devices/trackers on site and uploaded to diagnostic system
  - Prescriptions provided to the patient , allow easy access to needed drugs
  - AI infection control, surgery, triage/bed management, supply chain, security/safety, education
  - Ambulance equipped with 5G technology (CT, Echo, EKG for real time communication)

- Internet hospitals and third party contractors
  - 5G, cloud computing, platforms supported by tech giant Huawei & medical consulting
  - Digitalization of the hospital (intelligentization) including payments
  - Move to have internet medical services into health insurance programs

- Unique problems
  - Initially funded provided by government but not sustainable
  - Aging society – expand to patients' homes – "smart medical community"
  - Public acceptance of 5G, trust factor, data security/privacy protection

Continued Concerns

- Health disparities
  - Racial minorities rate their health as poor or fair at same level as ten years ago
  - Telemedicine use less
  - Algorithms could potentially be used as a discriminatory practice
  - Predictive models could lead to systemic racism

- Legal/ethical considerations
  - Dehumanization; need relationship management and trust
  - Facial recognition software used for early detection and treatment of genetic disorders
  - Social media and social bots
  - Privacy of patient information
  - Cybersecurity protection needed

- Regulations
  - New frameworks needed
  - Used for fraud detection
  - US Department of Health Services AI Council
  - American and European Trade and Technology Council – shared governance
  - United Nations Human Rights Office of the High Commissioner

- The future
  - Must identify and reduce existing health disparities
  - Providers and carriers must ensure telehealth access for everyone
  - Involve caregivers and patient engagement
  - Expectations of patients changing – want seamless, personal and easy access
  - Must assure that AI bridges gaps; better leverage AI in health care