Informatics 442

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References

Telemedicine,mhealth and Wearables

Color index:

Main Text | **Female Slides** | **Male Slides** |
Extra | **Important** | **Dr's Notes (previous notes)**| **Dr's notes 442** | **Golden notes** |
Textbook
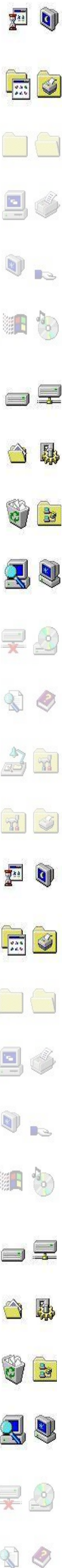
History of Tele-health

- The National Aeronautics and Space Administration (NASA) efforts in telemedicine began in the early 1960s

- The main goal was to provide remote health support and consultations to astronauts in space

- In 1989, NASA conducted the first international telemedicine program using one way video and voice

- Telemedicine consultations were conducted

Period	Telegraph	Telephone application
1835	Telegraph	Used in the American Civil War to deliver casualty lists and order supplies.
1876	Telephone	Initially used for voice communicaion. About 30 years later, used to transmit ECGs and EEGs.
1895	Radio	Used to supply medical advice to seafarer. In 1920 the Seaman's Church Institute of New York provided medical care using radio. The CIRM in Rome has been using it as well
Late 1960s	Video/ television	A two-way closed circuit television link was set up between the Nebraska Psychiatric Institute in Omaha and the state mental hospital in Norfolk for educational purposes NASA strted efforts for telehealth and telemedicine
1990s	Videoconferencing	Videoconferencing for health purposes became more common
Mid-1990s	Internet	Use of the internet for health purposes

Telemedicine

Telemedicine is defined as:
"the use of electronic information and communication technologies to provide and support clinical care when distance separates the participants"

Combinations of:
 – Telecommunications Technology
 – Medicine (clinical services)
 – Access to patients information (records)

-Telemedicine is composed of the Greek word τελε (tele) meaning 'far', and medicine. It is applying medicine when distance is an separating both sides "healing remotely" "applying medical services remotely"

- it is the use of telecommunication and information technologies for the provision of clinical care to individuals located at a distance
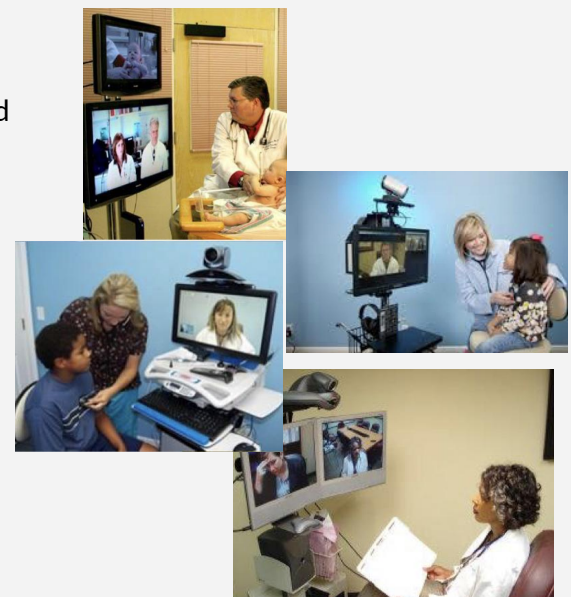
Telemedicine cont...

Main features of telemedicine:
- Usually is conducted in clinical settings
- Both sides include professionals
- Clinical service or clinical practice (clinical services)
- Utilization of secured telecommunications "using infrastructure -devices and networks that provided by health care provider- not personal telecommunication"
- Access to patients information (EMR & other records)

Telemedicine "includes professional in both sides in the same time using electronic medical record using hospital network" examples:
- **Tele-radiology** "consultation, reading and diagnosing images"
- **Tele-pathology** sending pathology images for diagnosis "
- Teleconsultations "for second opinion for a case"
- **Tele-ICU** " use to support the icu"
- **Tele-surgery** "support in surgery or conducting minimum invasive in procedure"

Tele-health vs. Tele-medicine	
Tele-health is :	**Tele-medicine is:**
The delivery of health- related services and information via telecommunications technologies **Provide clinical care**	the use of electronic information and communication technologies to provide clinical care when distance separates the participants **Provide health care related services**

EHealth

Also written e-health, is a relatively recent term for healthcare practice which is supported by electronic processes and communication, some people would argue the term is interchangeable with Health Informatics.

Four essential components make the e-health :

➤ Medical knowledge (data, information, knowledge) that lends itself to being stored in computer files (digital format)
➤ People who are willing/able to share, apply and use this knowledge
➤ Data processing equipment "tool" to record, store and process this data
➤ Telecommunication facilities to transfer (exchange) this data electronically between remote locations.

Telehealth vs. Telemedicine & ehealth

Telemedicine ➤ **Telehealth** ➤ **E-health** **Main umbrella** ☂

Telemedicine
-Tele-radiology
-Tele-pathology
-Teleconsultations
-Tele-ICU
-Tele-surgery

Telehealth
-Telecare
-Home monitoring
-tele-rehabilitation
-Remote patient education
-Consumer awareness
-Tele-Home support
-coaching

E-health
-Online information
-Online transactions
-Online interfacing with patient/consumer
-local use of e-services and transactions

Telehealth

Tele-health is defined as:
"The delivery of health-related services and information via telecommunications technologies"

• Could be: (nonclinical services) "health related"
Home care
Health education Using videoconferencing
Patient support
Home monitoring
-coaching

Telehealth would promote:
Patient-provider communications
Patient self-management with
feedback
Health literacy and education
Patient support and follow up
Home monitoring

Examples:
Patient Monitoring (Home care)
Blood pressure monitors

Interactive Applications
Tele-coaching, Videoconferencing

Store and forward applications
images, HBA1c

> Patients are setting at home and use device built in system that could take vital signs as an example and send it online to health care provider on the other side
> It is easy maintaining and support, help in patients education and all of this without need for travel

Why Telehealth/telemedicine?

• Access: Time, Travel, Expense, Information storage
• Health Provider Collaboration
• Enhanced Communications in all directions
• Smart Devices & Computer Applications common and non-threatening
• Improved professional education

Telemedicine/telehealth justifications

• Availability of Information management, and Patient information systems
• Medical data (signs, symptoms, test reports, etc..) – Appointment scheduling – Archival and retrieval of
patient records
• Low cost solutions – Using technologies
• Service to larger population – Through public health care delivery systems
• Development of knowledge-based system – For decision support – For training and education, etc.

Reasons and justifications

• Poor infrastructure in healthcare facilities "health care centers and hospitals are not well distributed and don't have proper access for the patients"
• Unavailability of experts (disparate distribution) "especially in rural areas"
• Lack of proper medical education "especially in small villages"
• Low physician-patient ratio and large populations "make it more difficult to patient to hve enough attention from physician and health care provider"
• Poor home care for elderly and special needs patient
• Poor choric disease management such as diabetes
• Ruler and isolated areas
• Low quality of health care and low access "because it is assumed that tele health and telemedicine should improve quality and accessibility for health care services"

Telemedicine/telehealth main objectives

• Improve diagnosis and better treatment and management
• Continuing education and training
• Quick and timely follow-up for patients
• Better and quicker access to comprehensive patients data
• Access to specialized healthcare services to under- served rural, semi-urban and remote areas
• Early diagnosis and prediction and treatment
• Reduce physician's fees and cost of medicine
• Reduce visits to specialty hospitals
• Reduce travel expenses
• Early detection of disease help in follow up
• Reduce burden of morbidity
• Sharing medical data between patients and health care professional
• Discussing a diagnosis, treatment plan, prescription or advice. which might involve patients located at a remote clinic, a physician's office or home.
• Specialist and consultants assisting general practitioners in rendering and diagnosis
• The transmission of images / videos along with patient data for diagnosis and second opinion
• Remote patient monitoring
• Collect and share data remotely for monitoring and interpretation and management
• "home telehealth" applications:
– Devices to capture a specific vital sign, such as blood pressure, glucose, ECG or weight. Which Supplement the use of visiting healthcare professionals .

Medical education and mentoring
For juniors, residents, physicians under training

– Provision of continuing medical education
– Special medical education seminars
– Targeted groups - expert advice provided
– Medical procedure training and discussion.

Consumer medical & health information

– the use of the Internet for consumers to obtain specialized health information
– On-line discussion groups to provide peer-to-peer support.

Ability to use intrusive to provide education and awareness for consumers not only patients and create hyper communication between patients and consumers and professionals to provide support "for example cancer patients"

Types of telehealth/telemedicine interaction can be classified as:		
Real-time "synchronous"	Store and forward	Remote monitoring
At the same time like in video conference Parties communicate simultaneously via a telecommunication network, also called synchronous or interactive	Record video or message that can be seen later Involves non-interactive transmission of information from on site to another. Sometimes referred to as asynchronous or pre-recorded and involves information being captured and then transmitted to the other party for advice, opinion or specialist consultation	A technique to monitor patients at home, in a nursing home or in a hospital for personal health information or disease management

Participants interactions

The nature of the communication in health can be:

1– **Patient with practitioner** (as we see in Telehealth)
-Telepsychiatry is a common application usually performed by videoconferencing (having telemedicine in telepsychiatry, the privacy for the patients is the main issue, this is why in most cases there's no other professional for other side)
-An evaluation of Telepsychiatry services in Alberta, Canada, showed that it was acceptable to users and there were significant cost savings from avoided travel by psychiatrists and patients
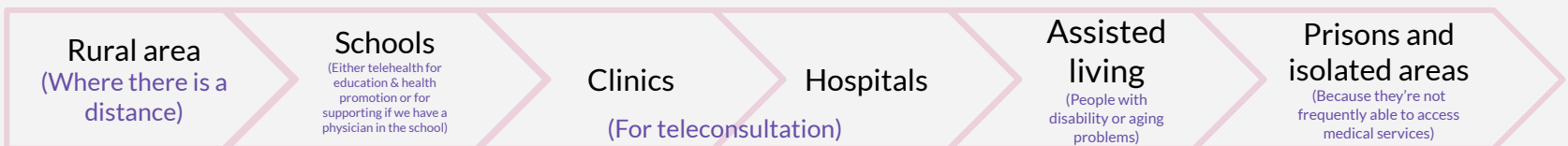
2– **Patient with patient** (that is, cyber community support)
-Support groups : communication between people who have similar condition. (To support each other and share experiences)
-A study of the use of audio conferencing by breast cancer patients in rural Newfoundland showed that it provided valuable mutual support, despite the distances.
– Website like PatientslikeMe provide both synchronous and asynchronous telehealth

3– **Practitioner with Practitioner** (like Telemedicine or Telehealth for education)

4– **Practitioner or patient only** (like the self education)

Telehealth/Telemedicine Settings

| Rural area (Where there is a distance) | Schools (Either telehealth for education & health promotion or for supporting if we have a physician in the school) | Clinics (For teleconsultation) | Hospitals | Assisted living (People with disability or aging problems) | Prisons and isolated areas (Because they're not frequently able to access medical services) |

Driving Forces of Telehealth/telemedicine

Quality of Care	Cost of care	Access of care	Others
-Provide diagnostics & better consultation -New mode of treatment -Improve patient satisfaction (early treatment, higher frequency of encounter	-Prevent/early treatment of disease = lower cost of care (both to provider and society) -Lower cost from travel (Reducing the cost, so we will provide services for more patients)	-Access for people with situational limitations (physical disabilities, elderly, etc) -Minimize distance of travel for people in hard to reach/isolated locations -Not limited by time/place (So we can use it if there's an issue with time or place)	(For people in prisons and not have services)

Identify equipment and technology to sustain telehealth

Four types of information transfer common in telehealth: Audio, text, still images, video

The following should be consider:
-Equipment to capture the information at each site (for example: the vital signs)
-Communication technology to transmit this information between the sites
-Equipment to display the information at the relevant sites
-Patient devices are easy to use and user friendly
-Harm free
-Secure communications

Emerging Telehealth/telemedicine applications

Telestroke	Teledermatology (Very easy to use)	Teleconsults	Telewound care	TeleICU
Teleophthalmology	Telecardiology	Telepsychiatry	Telepathology	Teleradiology
TeleEndocrine	Teletrauma	TelePediatric	Pre& post-surgical care	eVisits

Telestroke:

– ER Consultant conduct a CT Scan;

– Trained neurologist performs a live, real-time

audiovisual consultation

– Make diagnosis and appropriate treatment

recommendations;

– Send documentation electronically

Emergency Care and Trauma:

– Timely Trauma Evaluations For Patients In Remote Or rural areas.
– Assistance With Triage And Transfer Decisions.
– Learning Opportunities For Community Providers.

Mobile health

Mobile health (mHealth): is a term used for the practice of medicine and public health supported by mobile devices and applications.
 (It is Utilizing mobile services & applications for medical and clinical practice and public health domains)
-The term mHealth has been defined as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants and other wireless devices."
-The term is mainly used in reference to using mobile communication devices, such as mobile phones, tablets and PDAs, for health services and information.
-The mobile Health is a sub-segment of eHealth.
-The mHealth market earned estimated revenues of $230 million in 2010 and estimated to reach $392 million in 2015 in USA, according to a new report from research firm Frost & Sullivan.
-It was reported in 2016 that there were 259,000 health apps available globally and the trend is now slowing.
-Only 24% of healthcare apps recorded more than 50,000 downloads, most likely due to too many choices.
-In general, health apps do not generate that much income so not all will survive.(this is one issue of M-health applications)
-Consumer apps are the most popular type of healthcare app,
-in 2018 they recorded 106,4277 apps

Saudi Arabia: Internet Growth and Population Statistics
(Now our population having more access to internet, this is a very supporting fact that we can reach the patients)

YEAR	Users	Population	% Pop.	Usage Source
2000	200,000	21,624,422	0.9 %	ITU
2003	1,500,000	21,771,609	6.9 %	ITU
2005	2,540,000	23,595,634	10.8 %	C+I+A
2007	4,700,000	24,069,943	19.5 %	ITU
2009	7,761,800	28,686,633	27.1 %	ITU
2010	9,800,000	25,731,776	38.1 %	ITU

20111 USERS- > 12,500,000
2014 USERS- > 16,500,000
2015 USERS- > 21,500,000
2022 USERS- > 32,500,000
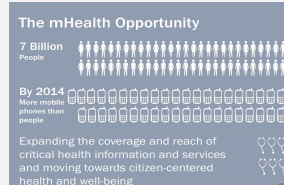
Consumer Health Informatics
• Mobile and internet subscriptions:
– In 2014 mobile services subscriptions 52.7 m (171%)
– In 2014 mobile data subscriptions 31.5 m (100%)
– In 2017 mobile services subscriptions 40.7 m (127%)
– In 2018 mobile services subscriptions 43 m (132%)
– In 2018 mobile data subscriptions 29.1 m (89.3%)

-Mobile is the most Pervasive technology ever invented
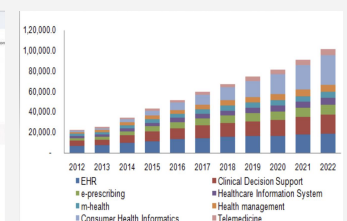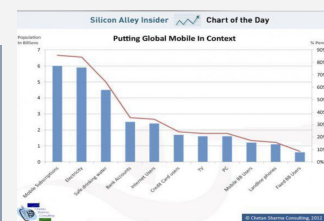
Mobile health uses

Health care providers use mobile health technology to:
– access clinical information (e.g., through mobile health apps and mobile-enabled electronic health records)
– collaborate with care teams (e.g., with secure text messaging)
– communicate with patients(e.g.,through patient portals and text messaging), (for patients education & teleconsultation)
– offer real-time monitoring of patients
– conduct research
– provide healthcare remotely

Patients use mobile health technology to:
– track their own health data through mHealth apps and devices, like the Fitbit®
– access their clinical records through mobile-enabled patient portals, (to access their data & hospital information system, for example: E-Sihi)
– communicate with their providers (e.g., through HIPAA compliant e-mail and secure text messaging).
– Receive clinical services, and consultations
– Track Their Health Vital Signs
– Receive Health Education And Awareness

Mobile health challenges

|	
Distraction: mobile technology, in particular smartphones and specifically text messaging can be distracting when combined with activities such as driving an automobile. Several studies have confirmed that mobile technology is also distracting in a medical environment. Which could increases medical. malpractice.48	**Privacy/security:** (big threat) clearly, mobile technology represents a security risk for patient data and the healthcare system's network.
Source of infection: there is evidence that mobile devices contain bacteria that could be harmful in certain locations such as the operating room.	**Interference with medical equipment:** there is a potential risk of smartphone electromagnetic radiation on pacemakers and other cardiac equipment. Some argue that phones should be kept at a distance of greater than 1 meter to be safe.
Lack of quality control: Due to the proliferation of mobile apps many argued that there needed to be a means to judge the quality of apps, particularly mHealth apps.(this is one main issue that the industry should be well organised and well monitored because it is serving a very big sector: the patients, consumers, relatives) – In 2015, an Australian expert panel convened and developed the 23-item scale Mobile App Rating Scale (MARS). This scale has excellent internal consistency (alpha = .90) and interrater reliability intraclass correlation coefficient (ICC = .79).52	**Lack of evidence:** despite more than 500 mHealth studies, there is a paucity of high quality evidence to show that mHealth positively impacts patient outcomes.
Financial unavailability: -The technology and communication costs being too high, sometimes make Telemedicine financially unfeasible. -cost effectiveness and return on investment are not well studied and communicated. (Very important to evaluate the cost effectiveness & in the same time communicate and publish these results to the decision maker)	**Literacy rate and diversity in languages:** – Some areas and countries has very low literacy rates examples in Africa and Asia. – Only very low rate of populations being well versed in English.

Characteristics of Patient Centered Care

-Respect for patients values, preferences & needs and privacy

-Coordinated and integrated care

-Information, Communication & Education (very important element)

-Physical Comfort

- Emotional Support

- Involvement of family & friends

-Continuity of care (one of the key element, it is like for patients who aren't able to travel most of the time)

-Access to care (so they can request referrals, discuss cases with professionals, asko for refill their medications with no need to travel)

It's a Different Ball game
In an eHealth environment, **Information Moves** rather than the Physician or the Patient
eHealth
ePhysician - eConsumer !

Telemedicine/ Telehealth & mhealth Outcomes

-Better control over the disease with less overall costs.
-Improve patient's quality of life.
-Less visits to the emergency department.
-Increase satisfaction.
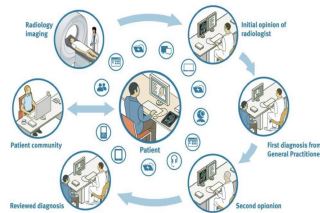
Is "At the Point of Care" Too Late?
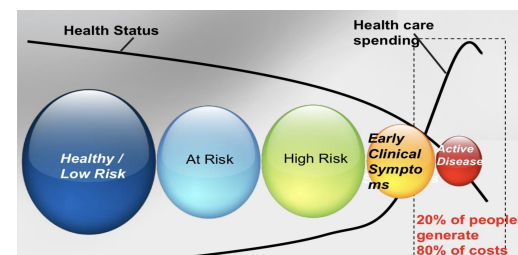
- Early detection of at-risk patients
- Provide personalized evidence to enable pro-active decisions

Telemedicine in Saudi Arabia

Few studies have been conducted about telemedicine in Saudi Arabia and three studies have conducted recently the last 2-3 years
-Telemedicine Towards Better Health Outcomes in Saudi Arabia: A Scoping Review
-Assessment of the Attitude and Current Utilization of Telehealth Applications Among Diabetic Patients in King Saud University Medical City, Riyadh Saudi Arabia
-Assessment of Physician's Knowledge and Attitude of Telemedicine in Riyadh Region, Saudi Arabia

Assessment of Physician's Knowledge and Attitude of Telemedicine in Riyadh Region, Saudi Arabia

Objectives: Assess the knowledge and perception of telemedicine and its applications among health professionals. Secondly, to determine their willingness towards adopting telemedicine in clinical practice.

Target group: Healthcare providers in Riyadh. 2017-2018

Methods: Cross sectional study conducted in 2016 in 4 medical cities: King Abdulaziz Medical City, King Faisal Specialist Hospital and Research Center, King Saud Medical City and King Saud University Medical City. Adapted questionnaire from previous studies.

Results:

-Characteristics:

391 Healthcare Providers
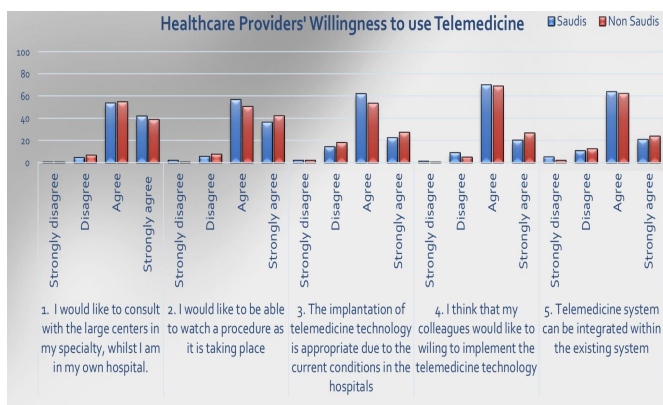
301 Male

90 Females

61% aged between 20-30

73% Saudis and 27% non Saudis.

-<u>Technology use:</u> 90% of Saudi participants have more than two smart devices compared to non-Saudis 87%.
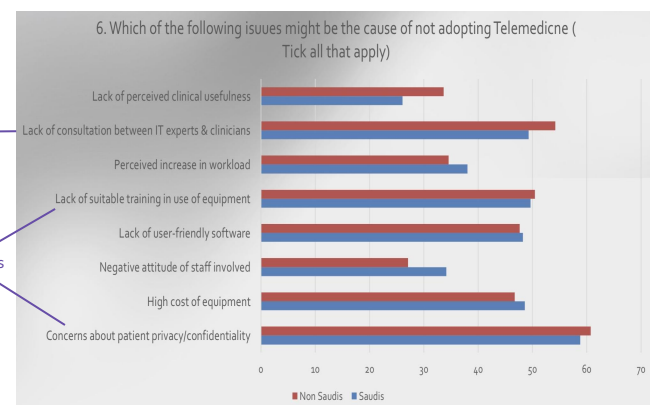
-95% Agreed and showed significant (P = 0.048) are willing to implement telemedicine.

-67 % of participants think that telemedicine is a viable approach for providing medical care services to patients.

Conclusion:

The findings of the study concluded that majority of the health professionals have moderate level of knowledge about telemedicine technology, however, majority of them have a high positive perceptions and are willingness to adopt it. The major barriers in the adoption of telemedicine reported are privacy, lack of training, cost and issues related to information and communication technology (ICT).

MCQs

1.Which of the following is considered an essential component for e-health?

A) Medical knowledge stored in physical files (analog format)
B) People who are reluctant to share and apply medical knowledge
C) Data processing equipment that cannot store and process data digitally
D) Telecommunication facilities for electronic data transfer between remote locations

2. What are some examples of nonclinical services provided through telehealth?

A) Surgical procedures conducted remotely
B) Prescription medication delivery to patients' homes
C) Health education through videoconferencing
D) In-person consultations with healthcare providers

3.Which of the following is promoted by telehealth?

A) Increased patient-provider communications
B) Reduced patient self-management with feedback
C) Limited health literacy and education
D) Decreased patient support and follow up

4. Support groups is an example of which one of the participants interactions?

A)   Patient with practitioner.
B)   Patient with patient.
C)   Practitioner with practitioner.
D)   Patient or practitioner only.

5. A term used for the practice of medicine and public health supported by mobile devices and applications, it is a definition of:

A)   Telemedicine.
B)   Telehealth.
C)   Mobile health.
D)   Bioinformatics.

6. What is the most important element of Characteristics of Patient Centered Care?

A)   Information, communication, education.
B)   Physical comfort.
C)   Emotional support.
D)   Involvement of family & friends.

Answer key
1.D   2.C   3.A   4.B.   5.C   6.A

Informatics 442

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