Patient Monitoring Systems

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Learning Objectives

1. Describe the **purpose, attributes, and functions** of patient monitoring systems
2. Discuss ways in which **automation can improve the quality of patient care**
3. Analyze how the **integration of data from many sources** assists in making **clinical decisions**
4. Discuss how **telehealth communication technologies support clinical care**
5. Discuss the **effectiveness and economic benefit** of telehealth
6. Examine how **smart technology in the home** and **remote links** to health information systems can enhance the quality of patient care

What is “eHealth”?

eHealth

- The World Health Organization defines eHealth as "…the combined use of **electronic communication and information technology in the health sector**" (WHO, n.d., para. 1).

- A **subdivision** of eHealth is **mHealth?**

mHealth

- According to the mHealth Alliance, mHealth is

"The **practice of medical and public health through the usage of mobile devices**.

Technologies?

(mHealth Alliance, 2010b)

mHealth Technologies

- Mobile/smart phones
- Personal digital or data assistants (PDA)/palmtop computers
- Wireless tablet computers
- Wearable wireless bio-sensors and/or wireless chronic disease monitoring devices?
- mHealth applications (apps)?

(Nelson, 2012, para. 2)

What is a “patient monitor”?

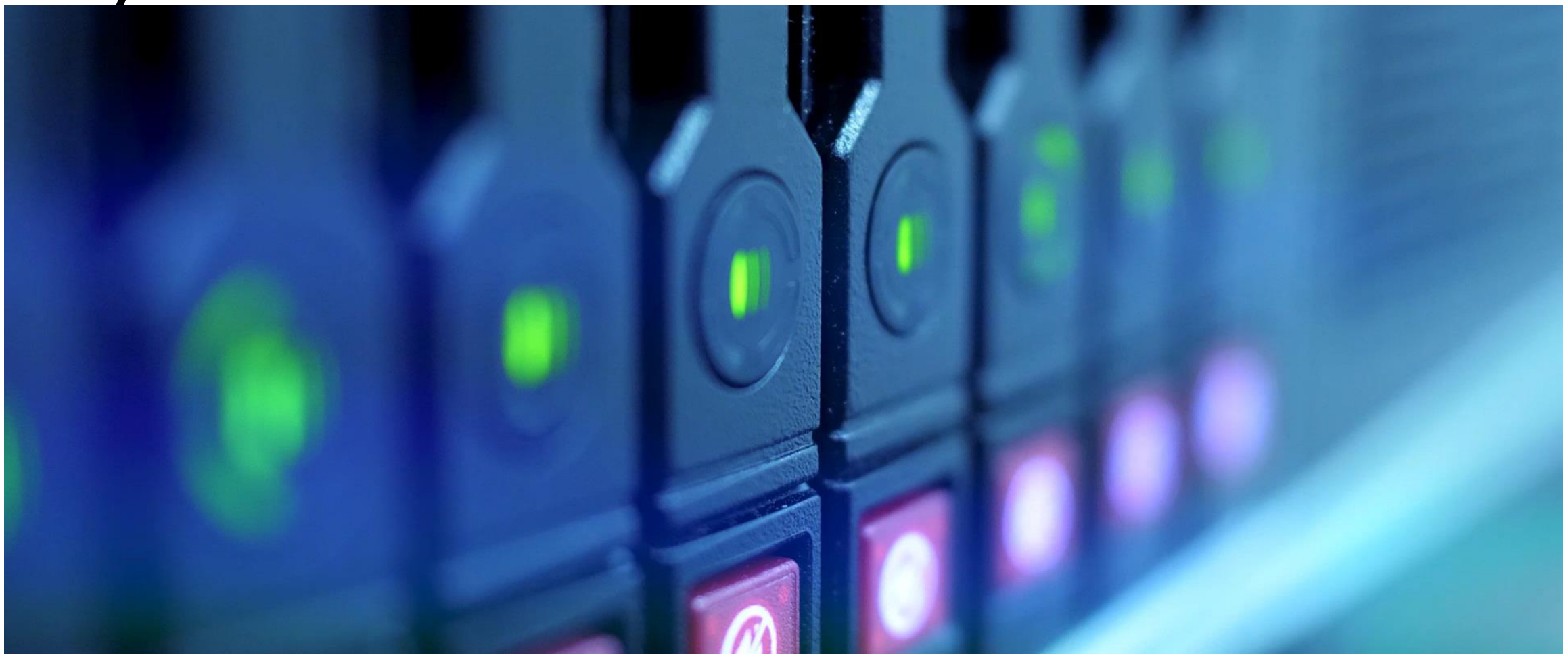
Patient Monitor

- Patient monitor:

  "An instrument that collects and displays physiological data, often for the purpose of watching for, and warning against, life-threatening changes in physiological state."

(Gardner & Shabot, 2006, p. 969)

What about “Patient Monitoring System”?



Patient Monitoring Systems

- Patient monitoring:

  "Repeated or continuous measurement of physiological parameters for the purpose of guiding therapeutic management."

Common site of use?

(Gardner & Shabot, 2006, p. 969)

Purpose

- Assist providers with:
  - Diagnostic decisions
  - Therapeutic choices
- Support decision-making
- Improve care delivery

Some specific purposes for patient monitoring devices used in the intensive care unit (ICU) are:

- "To acquire physiological data frequently or continuously, *such as?*
- To communicate information from data-producing systems to remote locations *(e.g.?)*
- To store, organize and report data
- To integrate and correlate data from multiple sources
- To provide clinical alerts and advisories based on multiple sources of data
- To function as a decision-making tool that health professionals may use in planning the care of critically ill patients
- To measure the severity of illness for patient classification purposes and
- To analyze the outcomes of ICU care *in terms of?*

Attributes

- Historical
  - Instrument for monitoring
  - Microcomputer
  - Communication protocol
  - Patient monitoring software

Attributes

- Knowledge-based monitoring system
  - Traditional components
    - Data acquisition component
    - The presentation component
    - The database component
  - The intelligent component

Functions

- Monitors physiological data
- Captures raw data
- Processes raw data
- Communicates data
- Displays data?

Primary Applications

- Intensive/**critical care units**, operating suites, recovery rooms
- Other locations **within the hospital**
- **Remote** locations

Primary Applications

- Application
  - Intensive/Critical Care Units, Operating Suites/Recovery Rooms
  - Example: Bedside monitor

- Outcome
  - Strengthen the caregivers' clinical expertise
  - Reduce mortality risk

Primary Applications

- Application
  - Other hospital locations
  - Example?

- Outcome
  - Facilitate early diagnosis and timely decisions

Describe the picture!

Primary Applications

- Application
  - Remote Patient Monitoring (RPM)
  - Examples?

- Outcome
  - Better tracking
    - Patient conditions
    - Medication regimen adherence
    - Follow-up scheduling
  - Improves compliance

Data Integration

- Automated aggregation and consolidation of information
  - Variety of disparate systems and sources
  - Across
    - Sites of care
    - Domains
    - Technologies

Data Integration

- “Improves **communication and information sharing** among sites of care
- Offers a **richer picture of the patients' overall health** and health history
- Reduction of **redundant tests, procedures**, etc.
- Reduction of **costs for resources?**
- Provides for the **timely consumption of patient data** for physicians
- May tighten the **strategic bonds between hospitals and community physicians**” (Impact Advisors, 2008, p. 3)

Data Integration

- Use of wireless technology
- Physiological data with other clinical data

- Systems with **algorithms** help put into context the vast amount of data collected
  - Information distributed throughout the enterprise?

- Concerns?

What is Telehealth?

TeleHealth

- Health Resources and Services Administration (HRSA)
  - "Telehealth is the use of **electronic information and telecommunications technologies** to support **long-distance clinical health care**, **patient and professional health-related education**, **public health and health administration.**"
  - What **technologies** might be associated with telehealth **?**
  - What might be the used **equipment?**
  - **Subsets** of telehealth**?**

TeleHealth

- The Centers for Medicare and Medicaid Services (CMS)
  - "Telehealth (or Telemonitoring) is the use of **telecommunications and information technology** to provide **access** to health assessment, diagnosis, intervention, consultation, supervision and information **across distance.**"

Telehealth

- American Telemedicine Association
  - Telehealth/Telemedicine
  - Telematics
  - Telemonitoring

How Telehealth Supports Clinical Care

- Long-distance clinical health care
- Patient and professional health-related education
- Public health and health administration

Telehealth

- Long-distance clinical health care
  - Locations?
  - Applications
  - Benefits
    - Improved **access to care** including specialist care
    - Elimination of the barrier of **distance**
    - More **timely** initiation of treatment.
  - Example

Telehealth

- Patient and professional health-related education
  - Applications?
  - Benefits
    - improved **access to education** programs and instructors,
    - reduced training and educational **costs,**
    - elimination of the barrier of **distance**
    - enhanced **communication**.

Telehealth

- Public health and health administration
  - Applications?
  - Benefits
    - improved **access to information,**
    - elimination of the barrier of **distance**, and
    - more **timely** interventions.

Effectiveness and Economic Benefits of Telehealth

- Greater **access to care**
- Reduction in the **number of interventions** required
- Eliminate **unnecessary visits** to the home or emergency room
- Easier **access to specialists' advice**
- Availability of **physicians** if needed to **physician extenders**
- Added capability of providing **continuous care**
- Increased availability **of education**

Telehealth

- Characteristics
  - Well integrated into existing procedures
  - Use existing infrastructure where possible
  - Provide obvious improvement over alternative mechanisms

Role of Smart Technology in the Home

- Telehealth?
- Remote patient monitoring?

Smart Technology in Use

- Diabetes self management
  - Smart phones
  - Application software
  - Wearables

Summary

- eHealth, mHealth, & Patient monitoring systems
  - Purpose
  - Attributes
  - Functions
- Primary applications
- Data integration and clinical decision
- Telehealth and clinical care
- Benefits of telehealth
- Smart technology in the home


THANK
YOU

References

Bujnoch, Z. (2007, November 22). Advances in patient monitoring: Furthering the need for efficient information management. Retrieved from Frost & Sullivan http://www.frost.com/prod/servlet/market-insight-top.pag?docid=112698950

Center for Technology and Aging. (2010, July 19). Center for technology and aging award remote patient monitoring (RPM) technology diffusion grants. Retrieved from http://www.techandaging.org/PR_20100719_RPM_Grants_Awarded.pdf

Gardner, R. M. & Shabot, M. M. (2006). *Patient-Monitoring systems*. In Shortliffe. E. H., & Cimino, J. J. (Eds.), *Biomedical informatics: Computer applications in health care and biomedicine* (3rd ed) (pp. 585-625). New York, NY: Springer Science + Business Media.

Healthcare Data Integration Market Overview. (2008, September 30). Retrieved from Impact Advisors, LLC http://www.impact-advisors.com/UserFiles/file/IA%20Whitepaper%20-%20HC%20Data%20Integrator%20Market%20Overview%202008030.pdf

mHealth Alliance. (2010a). About. Retrieved from http://www.mhealthalliance.org/about

mHealth Alliance. (2010b). Glossary of terms. Retrieved from http://www.mhealthalliance.org/media_center/glossary-terms

Nelson, R. (2012 January). Exploring mobile health consumer trends. *Clinical Informatics Insights*. Retrieved from http://www.himss.org/ASP/ContentRedirector.asp?type=HIMSSNewsItem&ContentId=79113

Shindell, R. (2010, September 17). Remote monitoring: Patient benefits galore. Retrieved from http://ezinearticles.com/?Remote-Monitoring---Patient-Benefits-Galore&id=5029222

References

American Telemedicine Association. (n.d.). Telemedicine/Telehealth terminology. Retrieved from http://www.americantelemed.org/files/public/standards/glossaryofterms.pdf

Center for Technology and Aging. (2011). Remote patient monitoring. Retrieved from http://www.techandaging.org/rpm_program_page.html

Centers for Medicare and Medicaid Service. (n.d.). Telemedicine. Retrieved from http://www.cms.gov/telemedicine/

Florida Health Information Management Association (FHIMA) Comments on the Florida HIE Plan Overview. (2009). Retrieved from American Health Information Management Association (AHIMA) website: http://www.fhin.net/pdf/archive/FLHIEplan/comments/FHIMA.pdf

Goedert, J., (2010, October 14). AT&T to use, market diabetes tool. *HealthData Management*. Retrieved from http://www.healthdatamanagement.com/news/health-care-technology-news-diabetes-smart-phone-mobile-41164-1.html

Health Resources and Services Administration. (n.d.). Telehealth. Retrieved from http://www.hrsa.gov/telehealth/default.htm

Hebda, T., Czar, P., & Mascara, C (1998). *Handbook of informatics for nurses and health care professionals*. Menlo Park, CA: Addison-Wesley.

Miller, L. M. & Young, K.M. (2000). Telehealth. In Young, K. M. (Ed). *Informatics for healthcare professionals*. (pp. 221-233) Philadelphia, PA: F. A. Davis Company

Mostashari, F. (201, April 22). Testimony on aging in place: The national broadband plan and bringing health care technology home. Retrieved from http://aging.senate.gov/events/hr220fm.pdf

Nelson, R. (2012 January). Exploring mobile health consumer trends. *Clinical Informatics Insights*. Retrieved from http://www.himss.org/ASP/ContentRedirector.asp?type=HIMSSNewsItem&ContentId=79113