



## LESSON 1: NETWORK SYSTEM & THE INTERNET

- **computer network** - exists whenever 2 computers connect and share the same data.
- **LAN** - most essential in automation in healthcare information system allowing communication and sharing of resources across different departments and sections of a healthcare institution
- **WAN** - increase emergence of electronic health record systems
- Enterprise networks

### BASIC PRINCIPLES OF NETWORK SYSTEM

- Network is formed when 2 or more computers are connected by wire or wirelessly.
- Network systems are essential to effective functioning of HIS.
- Takes advantage of the principle of TCP/IP.
- Network systems made it possible to have vast information originally generated and stored in separate department
- The information may be collected into a server
- network system, only 1 copy of the system and application software is installed on the server or central computer and cheaper licenses are encoded to the client computers
- network allows several clients to access and make use of the same program simultaneously.

### NETWORK TOPOLOGY

- physically set up using various arrangements or topology.

#### BUS TOPOLOGY

- **Bus networks** - (not to be confused with the system bus of a computer) use a *common backbone to connect all devices*.
- **Single cable**, the backbone functions as a shared communication medium that devices attach or tap into with an interface connector.
- **device** wanting to communicate with another device on the network sends a broadcast message onto the wire that all other devices see, but only the intended recipient accepts and processes the message.

#### RING TOPOLOGY

- **ring network** - every device has exactly two neighbors for communication purposes.
- All messages travel through a ring in the same direction (either "clockwise" or "counterclockwise").
- A failure in any cable or device breaks the loop and can take down the entire network.

#### STAR TOPOLOGY

- **star network** - features a central connection point called a
- "hub" may be a hub, switch or router. Devices typically connect to the hub with **Unshielded Twisted Pair (UTP) Ethernet**

#### TREE TOPOLOGY

- integrate multiple star topologies together onto a bus.
- simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices.
- **bus/star hybrid approach** supports future expandability of the network much better than a bus (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub connection points) alone.

#### MESH TOPOLOGY

- involve the concept of routes.
- Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination.
- messages can only travel in one direction

- Some WANs, most notably the Internet, employ mesh routing.

### INTERNET

- Worldwide network of interconnected computer networks that operates using a standard set of communications

### TECHNOLOGIES BEHIND THE INTERNET

#### MAIN PRODUCTS ON THE INTERNET

- **Transmission Control Protocol (TCP)** -
  - allows computers to connect to a network and exchange data;
  - carries the task of breaking messages into small packets (datagrams)
- **Internet Protocol (IP)**
  - considered a *lower-level protocol* which is responsible for making decisions on the packets and routing them.

#### OTHER PROTOCOLS ON THE INTERNET

- **Hypertext Transmission Protocol (HTTP)**
  - which supports the World Wide Web (WWW)
- **File Transmission Protocol (FTP)**
  - permit users to send all types of electronic files over the Internet

#### ADDRESS SYSTEMS IN THE INTERNET

- **IP Address**
  - unique address which identifies a computer when connecting to the Internet
  - Allows a computer to transmit information to other computers without getting lost
  - Uses a number from 0 - 255 for each part of its 4-part number: n.n.n.n
    - Ex. 190.102.4.2
- **Domain Naming System (DNS)** was created to replace the numbers.
- Server name - Domain name - Top-level domain name
  - EX: of top-level domain names:
    - **com** - business or commercial
    - **edu** - school institutions
    - **gov** - government agency or department
    - **mil** - military
    - **et** - network service provider or resource
    - **org** - organization usually nonprofit
    - **int** - restricted to organizations established by international treaties
  - Country top-level domain names:
    - **ph** - Philippines
    - **us** - United States
    - **ca** - Canada
    - **uk** - United Kingdom
    - **au** - Australia
    - **nz** - New Zealand
- back of each domain name is a **fixed IP address**.
- Domain names are registered to an accredited Domain Register Website and enter a huge database.
  - **ICANN** (Internet Corporation for Assigned Names and Numbers)
- **URL (uniform resource locator)** - Every web page is accessed through its unique address
- Each component in the address is separated with a slash
  - Example:
    - **http** - protocol used to transmit the web page
    - **www.eclipsys.com** - domain name or name of computer
    - **solutions** - main folder that stores the web page file
    - **systems** - subfolder that stores the web page file

# NURSING INFORMATICS NCM 110J

A.Y. 2024-2025, MIDTERMS, 2ND TERM

- **decision support** - filename of the web page
- **htm** - file extension name of the web page

## NATURE OF THE WEB PAGE

- Composed of Background, texts, colors, headings, links, graphics, sound and animation
- **Source Code** - HTML tags that instruct the browser to control the behavior of the tagged element

### A. BROWSER

- Fetches and displays web pages
- Assembles all elements in a web page and displays them on a screen according to specifications contained in the HTML tags
- Provides a **copy command that allows you to copy** a section of text or graphics from the web page which you can paste to one of your documents

### B. SEARCH ENGINE

- Website that provides tools to help you find pages of information
  - Google
  - Ask
  - Bing
  - YAHOO!
  - Yandex
  - Bai 百度
  - WOW
  - DuckDuckGo
  - AOL.

## SERVICES ON THE INTERNET

### 1. COMMUNICATION SERVICES

- E-mail
- Bulletin Board
- Chat
- IM
- Listservs
- Newsgroup
- Video Conferencing



### 2. INFORMATION SERVICES

### 3. FILE TRANSFER SERVICES

- Downloading
- Uploading

### 4. CONNECTING TO THE INTERNET

- **Wired Internet Connections**
  - Dial-up
  - Cable
  - DSL - Digital Subscriber Line
  - Dedicated Lines
- **Wireless Internet Services**
  - **Satellite Connection** - uses low-Earth satellite to transmit computer data directly to and from a satellite dish owned by an individual
  - **WiMAX** - Wide Area WiFi
  - Internet Access with Mobile Devices.

### 5. SEARCHING IN A DATABASE

- Searching for data involves matching specific attributes about the entity with the field where the data is stored
- Data warehouse of a HIS serves as a vast table containing all data that could be entered into by users within a healthcare organization that is related to patients moving in and out of a healthcare institution.

## INFORMATION LITERACY IN NURSING

### LATE 1980s

- fast growing Internet called for all nurses to become information literate

- Evidence-based nursing practice, critical thinking and long term learning -> upgrade to info literacy rather than computer literacy

### 2001

- ANA described information literacy as a required skill for all beginning nurses
  - "How did I manage without it?"
  - "It's useful, let's get at it!"

## (5) EDUCATION INFORMATION LITERACY STANDARDS

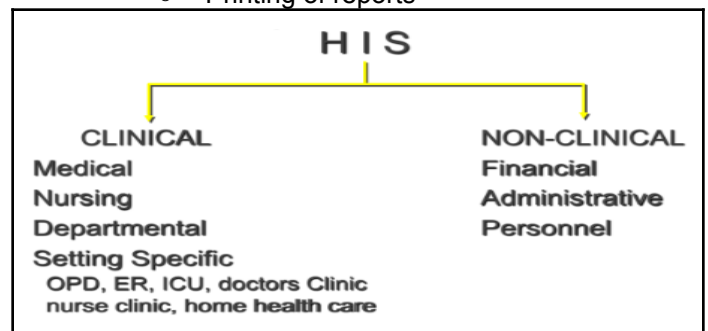
- (1) Ability to identify information needed
- (2) Ability to access information efficiently
- (3) Ability to evaluate the veracity and usefulness of an accessed data - **Reliable, Timely, Accurate, Verifiable, Accessible, Useful, Disclaimer and Feedbacks**
- (4) Ability to use the information for a specific purpose
- (5) Ability to recognize economic, legal, social and ethical issues surrounding information use

## DIFFERENT WEBSITE FOR NURSES

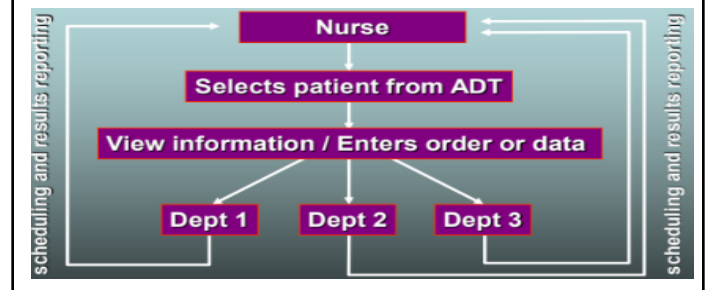
- Automating the Hospital Information System Automated HIS Technologies

## HOSPITAL INFORMATION SYSTEM (HIS)

- Sum of all automated and non-automated information and communication systems in a healthcare institution
- **Non-automated systems:** facilitated by human resources
- **Automated systems:** provided by computers connected to other computers via network
  - Patient-centered
  - Viewing of information
  - Data entry
  - Point of care (POC)
  - Decision support
  - Communication (P2P, SMS, Email video conferencing)
  - Reference
  - Printing of reports



## COMMUNICATION FLOW IN A NURSING INFORMATION SYSTEM



DOCUMENTATION	PAPER-BASED	PAPERLESS
<b>ORDERS</b>	Varies with different physicians and care team, ambiguity common	Standard terminology and form for all disciplines of care
<b>VITAL SIGNS &amp; CHARTING</b>	Data entry and graphing done manually, color coded	Entered regularly, automatic graphing, synchronized recording
<b>KARDEX</b>	Record not legal and not saved in patient record	Viewed electronically as a summary of patient data
<b>WORKLIST</b>	Written in individual treatment forms and	By product of orders and plans of care,

# NURSING INFORMATICS NCM 110]

A.Y. 2024-2025, MIDTERMS, 2ND TERM

	medication forms for each patient	easily generated as individual or group of patients
<b>RESULTS</b>	Recorded in individual forms from each department	Saved in the EHR database, text and graphics displayed on demand
<b>CLINICAL DOCUMENTATION</b>	Progress, assessment, nurses notes on individual sheets, as narrative	Entered on templates, checklists, flow sheets, narratives minimized
<b>DISCHARGE SUMMARY</b>	Sent to medical records with other records; discarded after 5 years.	Updated demographic and clinical data permanently integrated in EHR
<b>OUTCOME VARIANCE</b>	Not readily present in charts, analysis of time data required	Direct insights on promptness and timeliness of treatment & intervention, improves quality of care

**PATIENT BILL INQUIRY** DIV: PD  
 ROOM NO: 3121 ADMISSION NO: 08F01323  
 PATIENT: PAYOT LEANDRO

PROCEDURES:	33,832.80
PHARMACY:	12,403.60
RMNERD:	7,032.50
OTHERS:	20.00
<b>TOTAL BILL:</b>	<b>53,288.80</b>
DEPOSIT:	12,000.00
CM:	88.50
<b>BALANCE:</b>	<b>41,200.30</b>

NOTE: PLS. INFORM THE PATIENT'S RELATIVES THAT THIS BILL IS TENTATIVE AS OF YESTERDAY. THANK YOU!! [ USTH DEV GROUP™ ]

Date	Department	Code	Description	Price	QTY	Total
2008/06/25	DEPOSIT	#F008-101035	NO CREDIT M...			10,000.00
2008/06/25					CS TOTAL:	0.00
2008/06/25	ANATOMIC PATHOL...	083P-1752	EXTRA LARGE SPECIMEN (5.8 SLIDES) (PRDC.FEE)...	3,360.00	1	3,360.00
2008/06/25					CS TOTAL:	3,360.00
2008/06/27	BLOOD BANK	083BP-8033	CROSS-MATCHING (3-PHASE) ** 08803	775.00	2	1,550.00
2008/06/25	CENTRAL SUPPLY...	047P-8155	DISPOSABLE GLASSES	7.00	2	14.00
2008/06/25			LUBRICATING (JY) JELLY SOLES	15.00	2	30.00
2008/06/25					CS TOTAL:	29.00
2008/06/26		047P-45277	VENI ON G. SB	187.00	1	187.00
2008/06/26			IV START PACK W IV SITE	136.00	1	136.00
2008/06/26			SOLUBLE ASSE 1.5X 600000	39.00	1	39.00
2008/06/26			DISPOSABLE GLOVES	72.00	1	72.00
2008/06/26			COTTON BALLS 10'S (BSPACK)	5.00	1	5.00
2008/06/26			COTTON SWAB	5.00	1	5.00
2008/06/26					CS TOTAL:	436.00
2008/06/26		047P-45367	RELATION FILM (SMBLEK)	20.00	1	20.00
2008/06/26			DISPOSABLE GLOVES	7.00	2	14.00
2008/06/26			LUBRICATING (JY) JELLY SOLES	15.00	2	30.00
2008/06/26					CS TOTAL:	72.00
2008/06/26		047P-45410	ENEMA SET ** C5039	135.00	1	135.00
2008/06/26					CS TOTAL:	135.00

**PATIENT'S DOCTOR INQUIRY**

Patient Info  
 Room No: 3120 Admission No: 08F01594 Div: PD  
 Patient Name: TORRALBA LUCILA

Code	Doctor	Type
YM1	YAMAMOTO MILAGROS	PHYSICIAN

**DEFECTIVE ROOM SAN MARTIN**

Room No: 3109 Div: PD SUNSHINE LACANILA

Defect: [ ]

[ DEFECT ] [ CLEAR ] [ CLOSE ]

**ATAYAN, SALOME** Admission No.: 08G00057  
 Patient's Address: T VELANTE DRIVE CUBAO QUEZON CITY Admission Date: 01/07/2008  
 Room Number: 3111

**Diet List Information:**

Patient's Height: [ ] Patient's Food Preference: [ ]  
 Patient's Weight: [ ] Patient's Food Dislike: [ ]  
 Clinical Impression / Diagnosis: [ ]  
 Diet Prescribed: [ ] Allergy: [ ]

[ Save ] [ Cancel ]

**e-REQUEST FORM**

WARD: SAN MARTIN ROOM: 3112  
 ADMISSION NO: 08F01567 DIV: PD  
 NAME: YUCHINGTAT PAOLO

REQUEST TO: [ ] GET ACCLARY

REQUEST: [ ] LIMIT: 500 CHARACTERS

TYPE OF REQUEST: [ STAT / RUSH ] [ SCHEDULED ]

**SELECT LABORATORY PROCEDURE CATEGORY**

BLOOD BANK PROCEDURE  
 URINE, STOOL & OTHER BODY FLUIDS PROCEDURE  
 WITH BLOOD EXTRACTION PROCEDURE

**WSystem security**

USERNAME: [ ]  
 PASSWORD: [ ]

[ Login ] [ Cancel ]

**CCU** PLS SEPARATE THE REQUEST OF SPECIMEN TYPE REQUEST!

ON ALERT: 0 NO. OF REQUESTS: 32 CANCELLED: 2 ONLINE RESULTS: 0  
 BILL COMPLETED: 0 FOR EXTRACTION: 0 NEED CANCEL LISTED: 0 FOR APPROVAL: 0

ROOM#	PATIENT	DIV	HOSPITAL#	ADMIT DATE	Diet Prescribe	Date Posted	PX Info	Pending ID	Cleaning
CCU A	LIM RIMBERTO	PD	05-26-93	2009/08/21	OF 30 KCAL.RG.DIET.A.S GING C...	2009/08/28	INCOMPLETE	1	1
CCU B		PD						0	0
CCU C		PD						0	0
CCU D		PD						0	0
CCU E		PD						0	0
CCU F		PD						0	0
CCU G	MATEO LILIA	PD	04-93-53	2009/08/27	SOFT DIET 1800 KCAL 270 G CHL...	2009/08/28	INCOMPLETE	0	0
CCU H	SARCOMA ROSARIO	PD	05-22-45	2009/08/30	FULL IN CONFINEMENT	2009/08/28	INCOMPLETE	0	0
CCU I	LIM ROSALINA	PD	03-18-36	2009/08/27	30 KCAL.RG.DIET U.S G CHOM 65...	2009/08/28	INCOMPLETE	0	0
CCU J		PD						0	0
CCU K		PD						0	0
CCU L		PD						0	1

**Alert For Discharge**

Room No: [ ]  
 Admission No: [ ] Division: [ ]  
 Patient's Name: [ ]  
 Alert Date: [ ]  
 Alert Time: [ ]  
 Nurse: [ ]  
 EXP. RES.!!

DISCOUNT CHECK LIST BEFORE DISCHARGE

SENIOR CITIZEN  PHIL HEALTH  
 GSIS MEMBER  HMO

<< ALERT NOW >>

**CCU** PLS SEPARATE THE REQUEST OF SPECIMEN TYPE REQUEST!

ON ALERT: 0 NO. OF REQUESTS: 32 CANCELLED: 2 ONLINE RESULTS: 0  
 BILL COMPLETED: 0 FOR EXTRACTION: 0 NEED CANCEL LISTED: 0 FOR APPROVAL: 0

ROOM#	NAME	TIME	DATE	NURSE	ROOM#	NAME	TIME	DATE	OFFICER

# NURSING INFORMATICS NCM 110

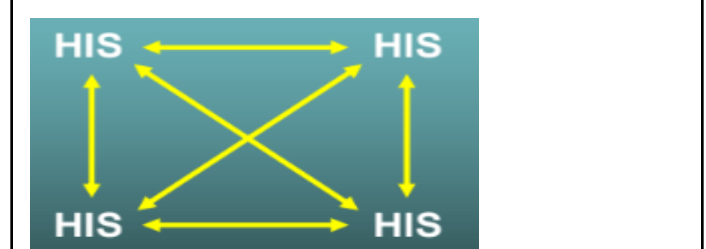
A.Y. 2024-2025, MIDTERMS, 2ND TERM

## ELECTRONIC CHART SYSTEM

- Extremely mobile**
  - Portable
  - Wifi enabled
  - Battery operated
  - POC
- Solid state memory**
- Touch screen**
- Consistent availability**
- Works 24-7**
- computer on wheels (COW)**
  - Extremely mobile
    - Sits on cart
    - Wifi enabled
    - Battery operated
    - POC
- May use mouse
- Frees hands to do more work

## HIS PROGRAM

- Oracle, SQL, FOSS
- Database software
- Communication software
- Radiology information system RIS
- Laboratory information system LIS
- Interconnects to form EHR



## ELECTRONIC HEALTH RECORD SYSTEM (EHRS)

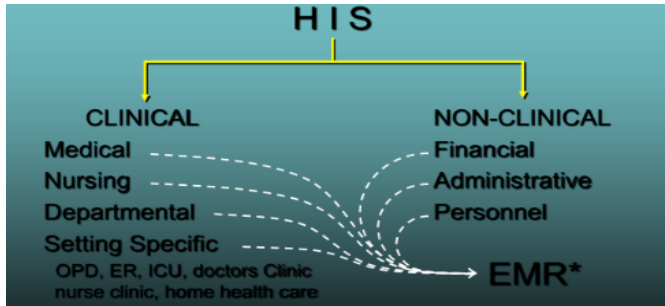


## ADVANTAGES:

- Alerts clinicians if an order they are entering could cause a problem
- Notification system that alerts clinicians to clinically significant events
- Visual posting system that alerts healthcare

providers to issues specifically related to a patient on opening of a patient's electronic chart including crisis notes, adverse reactions and advance directives

- Template for automatic creation of reports
- Clinical reminder to alert actions like exams and immunization, patient education, lab tests that need to be performed
- Remote data viewing to see patient record at facilities where the patient was seen.



## ELECTRONIC MEDICAL REPORT (EMR)

- Patient demographics
- Medical insurance details
- Medication prescription
- Nursing care elements
- Allergies
- Immunization record
- Lab/imaging results
- Specialists results
- Drug database
- Appointments
- Special treatments
- Billing records

## LABELING SYSTEMS

- **Barcode scanning technology** to identify patient at POC
- **Barcode scanner** is hooked to a portable printer that prints the label that is promptly placed on the container or any item needed to be labeled.

## ELECTRONIC MONITORING SYSTEM

- Wall mount type
- Directly connects to devices hooked to the patient via cables and ports
- Links with health care information system via wired or wireless network system

## CRITICAL CARE MONITORING SYSTEMS

- Virtual monitoring (telemetry)
- Point-of-care medication administration tools
- Connectivity with bedside medical devices (BMDI) for interactive documentation
- More patients monitored simultaneously

## HOME HEALTH SYSTEM

- Tele-nursing system
- Favors chronic patients
- Daily vital signs monitoring
- Earliest detection of problem
- Reduce unnecessary readmission
- Increases number of patients served
- Reduce clinical mileage and drive time
- Remote education of patient

## MEDICATION ERRORS

- no one intends to commit a medication error - most people never know when they do. Yet errors injure nearly 1.5 million people annually
  - **INSTITUTE OF MEDICINE 2006**

## BARCODE - ENABLED MEDICATION ADMINISTRATION

- Search by patient name, financial ID number, medical record number or location.
- Verifies **"5 rights"**-right patient, medication, dose, route and time
- Access to patient demographics and allergies across all venues of care
- Documents meds administration and care details at bedside
- Thorough audit reporting
- Allergy checking and Ht/Wt/Age based dose checking at the point of care
- ISMP alerts (look-alike, sound-alike, and high-risk medications)
- Extensive reporting capabilities to facilitate tracking of near misses
- Real time online order entry confirmation
- Provides ability to communicate with pharmacy via email, fax or printer
- Online drug reference access with direct links to medication information from patient profile (Lexi-comp, MicroMedex, Clinical Pharmacology)

## AUTOMATED MEDICATION DISPENSING SYSTEM

- Based on individual patient treatment regimen
- Monitors doctor's order, nurse requests, pharmacy unit preparation and delivery to nurse station
- Alerts for errors and adverse reaction
- Automatic dispensing of drugs and supplies
- Complete formulary for reference
- Narcotic check

## LABOR ERRORS

- "Errors that occur prior to analysis within the laboratory, particularly identification errors, are the most common serious laboratory errors".
  - (Bonini, Clin Chem 2002)