Informatics
Team Notes

The following slides are the original lectures. Only notes were added and they're mostly additional information.
431 team notes are in purple color and this year's notes are in green color.

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Teams

Clinical Decision Support

Knowledge + specific information + filter + presented at the right time = increase quality of life

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What have you learned so far?

- **Electronic Health Record**
- **Medical Error and how to overcome ME**

Functions of Health Information Technology:

- **Improve Clinical Outcomes/ Enhance Patient Care**
- **Efficiency and Effectiveness**
- **To improve decision making** **(only improve + support , not replace)**

This slide describes the three main components of a DSS. It is important to note that, because of the need for analyzing and manipulating data, DSS typically operate with extracts or copies of production databases so that using the DSS does not interfere with critical operational systems.

Star Trek & Diagnostic Device

Futuristic ....

- In *Star Trek*- point diagnostic device to patients and device determine
  - What is the problem ?
  - How serious damage is?
- In Star Trek- Diagnostic device is the "Clinical Decision Support"
- Societal Concerns
  - Can computers replace doctors in making decisions?
  - What kinds of decisions can computers make?
  - How good will computers be?
  - What will the effects be on the practice of medicine, on medical education and on relationship among colleagues or between physicians and patients? (fear of lose of relationship between humans)

Clinical Decision Support System (CDSS)

Definition: imp**

Provide clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care" [1]

Clinical knowledge (data) is important because it will form the level of decision
-Where it comes from?
experience , books …
easiest way to find knowledge is research.

-Can computers replace doctors to make decisions ?
No!
-To what extent computers can make decision?
It just give alerts that the human will see and make a decision based on it.

Elements of CDS [1]

☐ Knowledge

☐ Provide evidence to meet physician information needs evidence is what you want to get because this is what forms the knowledge

☐ Meta-analysis of Randomized Controlled trials as evidences (RCT) Review of many many researches , experiments that have been done and applied > take the information from those papers and then it becomes a knowledge !

☐ Patient-specific Information

☐ Medication List (Efficacy of medication .> meta anaylisis > compaei and see what is the outcome)

☐ Problem Lists

☐ Lab results and other clinical data

Elements of CDS [1]

Intelligent processes need help of computers.

☐ Filtered (proccecing) show what u need

☐ Gathering and presenting pertinent data (important relevent date)

☐ Presented at appropriate time

☐ Provider able and ready to act on the information (I act upon the disscsion)

☐ Enhance Patient Care (outcome)

☐ Error prevention (alert if medication is contraindicated, and drug drug interaction)

☐ Quality improvement life easier

☐ Lab results and other clinical data

MYCIN [2]

☐ Gives ADVICE to clinicians

☐ Used Artificial Intelligence a computing program

☐ Production Rules– knowledge gathered from discussions among experts

Rule base or knowledge base is an example of the artificial intelligence.
This is a type of computer science that process information and make it as a knowledge.

Example:

Rule 507

Comprised of conditional statement (IF-THEN) gives you different outcomes .

Example : how to get to the other building? 1) stars 2) by car
CSD Will give you the different outcomes to support your decision

Decision Making in Medicine [2]

- Uncertainty
  - What is the diagnosis?
  - What should the intervention be?
  - What is the latest research that gives evidence the intervention really works?

Examples:
- Should John gets another chemotherapy?
- Should Mr. James undergo a third operation?
- Should Mrs. Blackwood be given hepatitis B vaccination as an intervention?

Why CDS?[1]

1. Questions

- Unanswered Questions

- Some doubts

A lot of clinicians have unanswered questions and doubts.
Also we have new questions arising every day. we need a system to help us answer them

Why CDS?[1]

2. Information

- Unmet information need not enough information
- Cannot process information too many information
- Lack of time lack of time and physicians can't reach right information
- Unsatisfied information need I have the information but it doesn't make any sense
- Unrecognized information need the user doesn't know what he needs

Why CDS? [1]

3. Inquiry = asking Q's
   - Needs time
   - Resource Intensive (Evidence, Literature, Knowledge)

   Solutions are needed…. CDS can help provide ALERTS and REMINDERS
   - To avoid errors and increase patient safety– new knowledge discovery – average 17 years to take evidence into clinical practice
   - CDS embedded in EMR to improve patient safety and reduce medical error

Characterizing CDSS[1]

- System Function
- Mode of Giving Advice
- Style of Communication
- Underlying Decision Making Process

Evidence Based Medicine & CDSS [1]

"…use of current best evidence in **making decisions ……..**"[2, pg. 194]

Ideally:

☐EBM that uses Randomized Controlled Trial studies

☐High quality literature

Weaker forms:

☐Expert opinion

Interventions– are not based on FORMAL studies – found in BMJ

BMJ – one of the leading source of EBM studies

http://www.bmj.com/research

Constructing DSS[1]

☐ Elicitation of Medical Knowledge   Getting knowledge from literature, experience

☐ Reasoning and Representation ⟶ Taking knowledge and representing it to the Computer language

☐ Validation of System Performance   To test if it's working or not.

☐ Integration of DSS Tools ⟶ To put things together

-when building a DSS you need computer scientists , system analyst as well as you need clinicians to get knowledge. You will be having a guideline.
-presentation will be done using software by writing codes and rules and the logic sequence for the rules; rules should be ordered.
-when the system is built you will try on some cases and see if the decision will match the one a human will take or not.

Types of CDSS [1]

1) Documentation Tool

* Provide complete documentation

*Well-designed order form

* Required fields & Proper information

* Reduce error of Omission by providing selection

* Provide **coded data** for CDSS

Types of CDSS [1]

Types	Sub-types	Examples
1. Documentation Tool		
	1.1 Patient Assessment Form	Pre-visit questionnaires
	1.2 Nursing Patient Assessment Form	Inpatient admission assessment

Types of CDSS [1]

Types	Sub-types	Examples
1. Documentation Tool		
	1.3 Clinical Encounter Patient Form	Intelligent Referral Form
	1.4 Departmental/multidisciplinary clinical documentation forms	Emergency department documentation
	1.5 Data Flowsheets	Immunization flowsheet

Dr. said will the question will be like: which one of the following is documentation tools?
or would give the subtypes and ask about the types

Types of CDSS [1]

2) Relevant Data Presentation

☐ Display relevant data –including costs

☐ Pertinent Data are displayed

☐ Complex Data – to show overall picture same concept of dashboard in the car, gives you the overall picture + highlights what's needed

☐ To highlight needed ACTIONS

Types of CDSS [1]

Types	Sub-types	Examples
2. Relevant Data Presentation		
	2.1 Relevant data for ordering	Display of relevant lab tests when ordering a medication
	2.2 Choice list	Suggest dose choice lists

Types of CDSS [1]

Types	Sub-types	Examples
2. Relevant Data Presentation		
	2.3 Practice status display	ED tracking display
	2.4 Retrospective/aggregate reporting/filtering	Physician "report cards"
	2.5 Environment parameter report	Recent antibiotic sensitivities

Types of CDSS [1]

3) Order Creation Facilitators

☐ Adherence to Standards (Guidelines)

☐ Making the right things EASIEST TO DO

4) Protocol and Pathway Support

☐ Provide support for multi-step care plan , protocol and pathway

Types of CDSS [1]

Types	Sub-types	Examples
3. Order Creation Facilitators		
	3.1 Single-order completers-consequent orders	Prompt Order Consequent Order Suggestions
	3.2 Order sets	General Order Set Post Op Order Set
	3.3 Tools for complex ordering	Guided Dose Active Guidelines

Types of CDSS [1]

Types	Sub-types	Examples
4. Time-based checking & protocol/pathway support		
	4.1 Stepwise processing of multi-step protocol	Tools for Monitoring and supporting patient clinical pathway
	4.2 Support for managing clinical problems	Computer assistant management algo

Types of CDSS [2]

5) Reference Information & Guidance

- Address recognized needs from physicians & patients
- "Infobuttons" – linked to references/standards

6) Reactive Alerts and Reminders

☐ Data entry level

☐ Immediate notification for errors and hazards

☐ Lack of an order- reminder

☐ Contradictions to a procedure

Types of CDSS [1]

Types	Sub-types	Examples
5. Reference Information and guidance		
	5.1 Context-insensitive	General Link from EMR to a reference program
	5.2 Context-sensitive	Direct link to a specific reference program

Types of CDSS [1]

Types	Sub-types	Examples
6. Reactive Alerts & Reminders		
	Alerts to prevent potential errors	Drug Allergy Alerts Drug Interaction aler Under/Overdose Alert

Summary

- CDS

Provide clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care[1] "

References

[1] Carter, J.H. (2008) . Electronic Health Records, 2nd edition, American College of Medicine.

[2] Shortliffe, E.H., Cimino, J.J. (2006).*Biomedical informatics: computer applications in health care and biomedicine*, 3rd Edition, Springer.