

# CLINICAL DECISION SUPPORT SYSTEM

Dr Saurabh Bhatia\*, Dr Rajat C, Kanika A, Variyata B.\*\*

\* Senior Principal Consultant and Automation Specialist, Dell Services, Noida. \*\*Summer Trainees, IIMR Delhi

## CDSS

CDSS stands for Clinical Decision Support System. It is a computer program which is made for the physicians and the nursing staff to help them take bet-

actions. CDSS increases the efficiency and prevents any unwanted event from occurring by alerting the physicians at various points in the patient care. It merely assists the physician in decision-making and its role is advisory in nature and not imperative.

name, date of birth, history of illness, history of medication, age etc .

3) A communication mechanism, which can provide lists of possible diagnoses, drug interaction alerts or preventive care reminders.

Decisions!!  
Decisions!!



ter informed clinical decisions. It helps the physician by giving relevant information about possible diagnosis, treatment and follow up

### How Does it work?

For effective working of CDSS, there should be:

- 1) Knowledge base that compiles clinical information on diagnoses, drug interactions and guidelines.
- 2) A program for combining that knowledge with patient information like his

Based on the various ways of working, CDSS can be divided into a knowledge based CDSS (the one that uses a pre-known knowledge base) or a Non-Knowledge based CDSS (the one that learns what the user does and then builds patterns and rules based on the pattern of the user group’s preferences).

### Types of CDSS

CDSS can be classified into:

**1) Knowledge based:** The knowledge based CDSS uses the IF/ THEN rule; for example if Ampicillin is given to a patient with pre-existing allergy to penicillin, it will show up as an alert.

**a) Rules:** In Rule based CDSS, a set of rules are coded into the system. For example if a patient’s BMI is <25, it’s OK but if it’s >30, the physician will get the alert for obesity work-up protocol, as per the rule fixed in the system.

**b) Logical condition:** It provides reminders and alerts to the physician and nurses, which help in preventing any unwanted situation from occurring. For example if a patient’s result for blood sugar is over 180 mg%, the system may suggest HbA1C

### Highlight

- > Helps you in decision making
- > Brings global knowledge at your fingertips
- > Learns as you use
- > Constant updates
- > Saves Lives
- > Saves Practices

### What comes next

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**Types of CDSS**

**CDSS:  
The Decision Kit**



**2) Non knowledge based:** In this method the computer learns from the past. For example if Crocin is repeatedly prescribed to those patients who have fever, the computer will learn this data and may start projecting it as a desirable drug whenever a patient of fever is shown in the system. This is somewhat like showing your most visited sites in Inter-

net Explorer. The learning is based on common methods like Bayesian technology. More advanced versions use **Artificial neural network** which allows the system to make educated guess, e.g if few symptoms like crepitus, swelling & knee pain are marked earlier as osteoarthritis, the system will link these parameters to OA for future. Some systems also use

Genetic Algorithms. GAs cannot effectively solve problems in which the only fitness measure is a single right/ wrong measure. However, if the situation allows the success/ failure trial to be repeated with different results, then the ratio of successes to failures provides a suitable fitness measure.

**Appropriate use v/s Limitations**

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|--|--|
| <ol style="list-style-type: none"> <li>1. Gives excellent results in objective situations</li> <li>2. Most suited for deciding care pathways. May fumble in diagnostic situations</li> <li>3. Excellent for counter-checks</li> <li>4. Can easily follow best practices</li> </ol> | <ol style="list-style-type: none"> <li>1. Final, comprehensive solution is not known</li> <li>2. "Man in the loop" essential</li> <li>3. Covers only a narrow field of medical knowledge</li> <li>4. Difficulty in getting the probability knowledge for possible diagnosis</li> </ol> |
|--|--|

**"CDSS can give highly accurate results in objective situations helping the physician in a go/no-go situation"**

**Advantages**

- It manages information, so as to retrieve it easily– CDSS are highly systematic and intelligently programmed so as to manage the information stored in it and make it easy to access at any point of time.
- It helps in avoiding redundancy– information once entered into any CDSS system is there forever and is re-usable.
- It provides reminders, before the consultation, which can prove to be very helpful- like allergies, drug to drug interaction etc. and this helps the physician avoid common mistakes.
- It is flexible – CDSS systems alert the physician but also let them override the advice
- It includes both common and uncommon probabilities in clinical diagnosis
- Ready to use at any point-of-care.



### Disadvantages

- It can adversely affect Doctor-Patient relationship due to doctor's pre-occupation with the computer
- It can make a Physician dependent on it and blunt his independent clinical judgment
- Knowledge based systems may be viewed as inflexible, not learning with doctor's working pattern
- It might be perceived as extra workload on healthcare practitioners
- It has uncertain legal and ethical implications
- It may prove to be technically challenging for people who aren't very familiar with computers .
- It has to be constantly updated and changed as per the legal and technology update
- Integration with all EMRs may not be possible and thus patient context is lost while switching between systems which is counter-productive and redundant



**Like everything else, CDSS has downsides, too.**

### Acceptability

**PROBLEM:** The acceptance of these systems has not been as high as most other healthcare technologies.

**REASON:** These systems affect the long history of traditional medical practices and doctors find it uncomfortable to switch over to a new technology, especially a system which constantly interferes in their thinking process.

**SOLUTION:** Physicians, caregivers, staff, administrators, and technical experts should work in collaboration in the design, implementation, and improvement of decision support systems so as to make the system an extension of the physician's workplace

### Pitfalls

- Overreliance on systems leading to knowledge-paralysis in emergency situations
- Legal systems assuming CDSS as benchmark and punishing doctors who do not use it/ heed it
- Blunting of physicians' gut feel
- Copybook therapies due to physicians' reluctance in overriding alerts



### Future

Healthcare sector is moving towards quality certification and accreditation leading to standard operating procedures, driving the demand for standard based applications.

Future belongs to an integrated healthcare scenario - where various healthcare entities will get connected on a common platform to allow information exchange between standard based applications. CDSS will play a great role in the future in reducing medical diagnostic errors and will be a part of every practice



Find more about the author on  
[www.SaurabhBhatia.com](http://www.SaurabhBhatia.com)

Dr Saurabh Bhatia  
MBBS,(AFMC) MS, FCR  
An automation consultant for 15 years,  
he runs a company TSML Solutions Pvt  
Ltd for providing health-IT solutions.

Currently he is working on his 2nd book  
'The Art of Hospital Automation'

If you wish to get your opinion about  
automation published in this book, visit  
<http://bit.ly/hospauto>

**Kanika Arora** is a physiotherapist & is actively pursuing healthcare I.T as her future profession. **Variyata Bagre** is also a physiotherapist & is interested in health care IT as she feels her aptitude is ideally suited to this upcoming field. **Dr. Rajat Chaudhary**, a Dental Surgeon by profession is passionately looking forward to contribute to HIT which has proved to be the backbone of the industry.

Dr Saurabh Bhatia



+91-917-5522-499

E-mail:  
[SaurabhBhatia@SaurabhBhatia.com](mailto:SaurabhBhatia@SaurabhBhatia.com)

## Few examples

**Glaucoma CASNET** used For Diagnosis and Treatment of Glaucoma

**MYCIN** It is one of the first expert systems to be developed in the 1970s; used for etiological diagnoses of bacterial diseases

**CADUCEUS**<sup>f</sup> The Medical Expert System that could diagnose 1000 diseases.

**AAP Help** Used For diagnosis of acute abdominal pain.

**Internist** First used for diagnosis of complex problems in internal medicine.

**Iliad** Uses Bayesian reasoning to calculate probabilities of around 1500 diagnoses.

just  
another  
example

**TheraDoc** uses a variety of standards compliant messaging work with currently existing software in the clinical setting to guide decision making as well as report trends in problems an institution may be encountering.

**Lifecom** artificial intelligence technology and a supporting suite of knowledge development tools. The Lifecom technology portfolio includes novel knowledge extraction and management tools, the artificial intelligence engine, and a highly graphical user interface.

**RODIA** *Relative Optical Density Image Analysis* used in medical imaging, medical diagnostics, orthopedic and other medical disciplines.

Open Source world also offers some interesting medical decision support systems. Search for ACAFE and EGADSS when you next visit [www.sourceforge.net](http://www.sourceforge.net)