Computerised decision-support systems can help health professionals bring together complex information and guide management and treatment

Using computerised decision-support systems

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Decision support is an extension of electronic health record or electronic patient record systems. As well as enabling health professionals to look up information about individual patients stored in the system and to consult evidence-based guidance, they give advice on the treatment and management most appropriate for that patient. They are designed to help with the process of clinical decision making.

Computerised decision-support systems match patient characteristics to a computerised knowledge base to produce patient-specific assessments or recommendations. Decision support can be paper-based, but computerised systems have the advantage of being able to quickly process patient-specific information and match it to computerised decision rules or algorithms.

This article discusses the benefits and limitations of using decision-support technology, which is becoming increasingly important as the use of health information technology systems becomes more common across healthcare.

I t can be argued that technology, and computerised decision-support systems (CDSSs) in particular, takes away the "art" of clinical judgement in nursing practice, and that standardised approaches to decision making remove the individualised and holistic approach to care practised by nurses. Contrary to this belief, CDSSs work by aiding clinical decision making; they cannot make decisions for health professionals, but they can provide advice and guidance on the best course of action.

Table 1 provides examples of how CDSSs can help to support clinical decision making. These are based on categorisations developed by Garg and Adhikari (2005) following a systematic review of the benefits of using CDSSs in healthcare settings. While the majority of these examples refer to use by doctors, the systems are increasingly being used by nurses taking on extended and specialist roles. A systematic review of their use in nursing carried out in 2007 found that formal evaluations were almost exclusively focused on telephone triage and assisting with dosing and appointment recommendations in anticoagulation management (Randell et al, 2007). However, it is likely that nurses use CDSSs across a much wider spectrum; for example many nurses are non-medical prescribers and may be using them to support drug dosing and prescribing.

Evidence base

One of the problems with the evidence base that is associated with CDSSs is that often studies do not measure patient outcomes, or sample sizes are too small to detect differences between groups of patients. Currently, there is no firm indication as to whether CDSSs are worth investing in, in terms of increased benefits in patient care processes or improved patient outcomes.

5 key points

1 Computerised decision-support systems match patient characteristics to a computerised knowledge base to produce patient-specific assessments or recommendations

2 The systems give guidance based on current evidence and best practice guidelines

3 Current evidence does not give a clear indication of the benefits of using the systems

4 Too little consideration is being given to how the systems will be integrated into existing work practices

5 It is essential to plan how the effectiveness of the system will be measured before it is introduced

Support systems provide guidance

The trials reviewed by Garg and Adhikari (2005) indicated that some types of CDSSs clearly improve care processes. For example, a reminder system designed to assist with the recall of patients for screening and procedures improved recall rates by 75%. The authors also found the use of a CDSS improved care processes around disease management in 62% of the studies reviewed, including rates of assessments and examinations for long-term condition management such as diabetes, heart disease and asthma. However, few studies indicate that using CDSSs improves outcomes for patients. There is a similar picture for studies evaluating the benefits of CDSSs used by nurses. Randall et al (2007) systematically reviewed only 13 studies and none of these indicated improvements in either nursing care or outcomes for patients with any certainty.

At a local level, the benefits of CDSSs may be more obvious, which may explain why their use is becoming more widespread and integrated into health information technology (HIT) systems. The systems are used by nurses working for telephone triage services such as NHS Direct, NHS24 (in Scotland) and the new NHS 111 service.

Selecting and implementing CDSS
Suitability
Clearly, CDSSs are not suitable for every type of healthcare decision. They are most useful in situations where health professionals need to pull together complex information from a variety of sources (such as information about individual patients and physiological measures with complex clinical guidance), and where there is enough time to make use of the system (Dowding, 2008).

Often the decision to use a particular CDSS is made at an operational level to give a "safety net" of guidance to health professionals undertaking a new role or extending their practice. This type of approach was found in a study evaluating how nurses use the systems in two areas – in one area, nurses were expected to use a CDSS to help guide the management of patients receiving warfarin therapy, in another to use a triage system to help them with decision making at a walk-in centre. In both areas, the systems had been implemented at an organisational level as a way of supporting an extended nurse role (Dowding et al, 2009a).

A number of factors must be considered when deciding whether to implement a CDSS, which will influence how successfully the system is used (Box 1).

Rationale
It is important to identify at the outset exactly what decisions need to be supported and have a clear rationale for why a CDSS will be helpful in this instance. Consideration needs to be given to whether or not this type of decision could benefit from a CDSS, and the potential impact on the patient if a decision was wrong (is it a rare but fatal event that would be prevented, or is it a decision that is made frequently but does not have a serious impact if it is wrong?).

Any current evidence that there is an issue with current clinical practice also needs to be taken into consideration, for example if local audit data shows health professionals are regularly taking decisions that do not follow evidence-based guidelines.

It is also important to clarify who will be using the CDSS and why. One of the main reasons HIT systems fail is because too little consideration is given to the needs of the system users and how a system will be integrated into their existing work practices.

Integrating technology
The technology associated with the CDSS – both hardware (the equipment needed to run it) and software (what the CDSS interface will look like) – must also be considered. Ideally CDSSs should be integrated into existing HIT systems, such as electronic patient records, so the information already stored in the database can be used as the basis for guidance and advice. This may be particularly appropriate for systems focusing on drug dosing and prescribing, as medical history, laboratory results and current prescriptions are needed.

Another consideration is how the CDSS actually interacts with the professionals using the system. Kesselheim et al (2011) highlighted the problem of "alert fatigue", where an electronic system has too many alerts related to different decisions, or where the alert is sensitive and triggered easily, leading to health professionals ignoring alerts. It is better to have fewer and more important alerts related to decision making, rather than less important alerts that are easier to ignore.

Organisational support
Implementing any technology effectively involves organisational support. This includes being clear on why the CDSS is important, a well-defined strategy for implementing and supporting the technology as it is introduced, and the provision of education and support to staff while they are using it.

It also requires a recognition that introducing the system may lead to both intended and unintended changes in the way health professionals work. Studies have shown that the way in which CDSSs are used by nurses changes depending on their expertise (for example, Dowding et al, 2009b); this highlights a need to recognise and be flexible in terms of when it would be appropriate to use a CDSS and when it would be reasonable to accept a health professional's clinical judgement.

TABLE 1. TYPES AND USE OF DECISION SUPPORT

Type of decision support	Examples
Diagnosis	● Assistance with mental health diagnosis ● Acute cardiac ischaemia/interpretation of ECG in accident and emergency departments ● Acute abdominal pain
Disease prevention	● Reminder systems for cancer screening ● Reminder systems for vaccination
Disease management	● Screening for complications, glycaemic control (diabetes) ● Hypertension management ● Antithrombotic prescribing ● Asthma treatment
Drug dosing and prescribing	● Anticoagulant (warfarin) dosing ● Theophylline dosing ● Alerts for potential drug interactions and toxicity with digoxin ● Alerts for prescribing errors (for example contraindications) in outpatients
Adapted from Garg and Adhikari (2005)	

BOX 1. **CONSIDERATIONS FOR IMPLEMENTING A CDSS**

● The decisions that need to be supported
● The individual(s) who will be using the system
● Where the system will be used
● Technology requirements to support the system
● Features of the CDSS itself
● How it will be implemented
● How it will be evaluated
● Safety of the system

Evaluating effectiveness

Mechanisms in place to evaluate the system's effectiveness once it has been introduced are vital. If the purpose of the CDSS is to improve either care processes (such as the number of patients recalled for screening) or patient outcomes (such as reducing the number of pressure ulcers) procedures must be in place to measure whether improvements are occurring. It may also be useful to monitor if and how the CDSS is being used by health professionals, and whether it has changed to the way individuals work in other areas that may threaten safety elsewhere in the care system.

Unintended consequences

Often the introduction of new technology can have unintended consequences such as behaviour known as "work arounds", these occur when the new technology does not fit with the way people work, or actively increases their workload and they develop strategies to "fix" the problem or work around it. One example of this was highlighted in a study by Koppel et al (2008); nurses were observed using an electronic medication administration system to make copies of patients' bar codes and fixing them to their clipboards to save time, rather than scanning patients at the bedside. This increased the likelihood of drugs being given to the wrong patient if they had more than one patient bar code attached to the clip board at a time.

Conclusion

There are a number of benefits to introducing CDSSs to support decision making in practice, including providing nurses and other health professionals with current research evidence to inform their decisions. However, there needs to be a clear rationale for their introduction and systems need to be in place to support implementation and monitor use once they have been introduced. **NT**

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