Clinical knowledge management at the point of care

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Abstract: In the developing world, clinical knowledge management in primary care has a long way to go. Clinical decision support systems, despite its promise to revolutionise healthcare, is slow in its implementation due to the lack of financial investment in information technology. Point-of-care resources, such as comprehensive electronic textbooks delivered via the web or mobile devices, have yet to be fully utilised by the healthcare organisation or individual clinicians. Increasing amount of applicable knowledge of good quality (e.g. clinical practice guidelines and other pre-appraised resources) are now available via the internet. The policy makers and clinicians need to be more informed about the potential benefits and limitations of these new tools and resources and make the necessary budgetary provision and learn how best to harness them for patient care.

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Introduction

This article is a brief review of knowledge management as it applies to practitioners at the bedside or point of care. Knowledge management means "enhancing the identification, dissemination, awareness and application of the results of research relevant to clinical practice in health and social care."[1] With the increasing pace of medical information explosion, much of information generated may not have direct impact on patient care. It is felt that effective knowledge management may offer some respite for the busy practitioners at the point of care.

Information needs at the point of care

Primary care physicians universally have heavy clinical workload. In Malaysia, a public primary care doctor handles approximately 50 consultations per day.[2] Over a typical week, his patients include hypertension (61 patients), upper respiratory tract infection (41), diabetes (39), pregnancy (22), lipid disorders (16) and asthma (9). The above clinical problems constitute 75% while a much larger variety of possible diagnoses make up the rest. Davenport and Smith suggested that doctors use two million pieces of information during clinical care.[3,4] However, not all of these information is immediately available at their fingertips and many unanswered questions remain at the end of the consultations.[5] When they do pursue for the answers, they merely rely on printed sources or asking a colleague.[5,6]

Clinical Decision Support System (CDSS)

Clinical decision support is the provision of "clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care."[7] CDSS typically includes electronic health record of clinical data (history, physical findings, diagnoses), test ordering and retrieval of investigation results (including imaging), and should support electronic prescribing. Enhancements that may be added to the CDSS are:

- diagnostic aids (prediction rules, risk scores, clinical calculators, diagnosis software)
- drug database (users can search for drug information such as brand/generic names, dosages, side effects)
- drug alerts (the user will be prompted to review a prescription if it matches patient's previously recorded drug allergy or potential drug-drug interaction)
- specific patient care reminders (e.g. flagging of elevated creatinine level when metformin is being prescribed, remind the user that beta-blocker is not the appropriate first choice antihypertensive in the absence of compelling indications)
- prescribing support for women who are pregnant or lactating.
- chronic disease management packages (to ensure delivery of evidence-based practice at regular intervals)

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- preventive care packages (reminder of screening activities)
- patient information leaflet (preferably multi-lingual)

The full implementation of CDSS reduces medication errors, improves compliance with screening recommendations, and ensure best practice in clinical care. The potential of CDSS in enhancing patient safety and quality of clinical care has given impetus to its implementation in developed countries.[8] However, successful implementation requires considerable investment in information technology, clinician buy-in and comprehensive and continually updated knowledge base at the back-end of the CDSS.[9,10] Furthermore, there is some doubt as to its cost effectiveness in view of the paucity of objective data demonstrating improvement in patient outcome.[11-13]

At the initial phase of implementation of CDSS, users may be frustrated by the large number of drug interaction alerts. There is option within the CDSS to limit reminder to serious drug interactions and the users can also overrule the CDSS if necessary. In general, a CDSS that can unobtrusively support busy clinicians in his day-to-day clinical works will be a boon. In view of the huge financial commitment and continuing information technology support necessary to make it work, each healthcare organisation will need to decide which component of the CDSS needs to be implemented first. However, it is important to bear in mind that a good CDSS is merely a tool to achieve better quality of care – achievement of this still requires conscientious clinician eliciting and documenting accurate clinical data and diagnosis, and communicating the clinical management effectively with the patient.

Point-of-care electronic resources

In the past, hard copy of textbooks, desktop drug reference, guidelines and journal articles are favourite sources of information for the clinicians. With the digital revolution, a bewildering variety of electronic resources are now available, including electronic books, drug information, electronic journals and databases, image bank, clinical practice guidelines and clinical calculators. All these resources may be stand-alone delivered via internet or mobile devices or seamlessly integrated with the electronic health record as part of the CDSS.

Some examples of point-of-care electronic books are given in Box1. All of them aim to be comprehensive, evidence-based, up-to-date electronic textbooks that deliver clinically relevant answers.

Box 1: Examples of point-of-care resources (subscription required)

Clinical Evidence.
http://clinicalevidence.bmj.com/x/index.html

Dynamed.
http://dynamed.ebscohost.com/

Essential Evidence Plus.
http://www.essentialevidenceplus.com/

First Consult.
http://www.clinicaldecisionsupport.com/first-consult

PIER.
http://pier.acponline.org/index.html

UpToDate.
http://www.uptodate.com/index

There is concern expressed by users as to the comprehensiveness of these point-of-care resources and the rating or grading of the clinical evidence. When formally evaluated, some do have better profile than others.[14,15] Furthermore, the ability to retrieve targeted answers is influenced by the experience of searchers in the use of these products.[16] Those point-of-care resources currently available in the market are produced in developed countries and may not cover conditions peculiar to specific culture or geographic region. For example, a search of Dynamed failed to find any reference on latah, koro and *Plasmodium knowlesi* (the commonest form of malaria in Sarawak, Malaysia).

Point-of-care resources merely deliver valid medical information on a specific topic, they cannot make the decision for the clinician. In Dynamed, a search for dengue NS1 antigen test retrieved the following: "Dengue NS1 antigen test ELISA: sensitivity 83.2%, specificity 100%, positive predictive value 100%, negative predictive value 38.2%." A user who is unfamiliar with these terminologies may have difficulty applying these clinical evidence in clinical setting. To fully optimise the use of the information available in these point-of-care resources, the clinician needs to be able to refine his clinical query into foreground questions (i.e. diagnosis, prognosis, therapy) and be able to interpret evidence-based medicine terminologies and use his clinical judgment to decide whether the information on diagnosis, prognosis and therapy is applicable to the patient in front of him.[17,18]

Clinicians or librarians as searchers

Finding time to look for answers to clinical questions in a busy clinical practice is a major problem for many clinicians. In the past, medical librarians and clinician searchers have been shown to be able to find answers for a majority of clinical questions raised by primary care physicians.[19,20] Unfortunately, the turn-around time (which may take several days) and the cost of this kind of service preclude their routine use.

End-users as searchers

The availability of internet and ease of search provided by web browsers such as Google means that clinicians are now more willing to conduct searches on their own. Studies so far have shown that clinicians have yet to fully capitalise on the freely accessible databases (e.g. PubMed, Cochrane Library) and the increasing amount of freely available full text journal articles (e.g. PubMed Central).[5] The reason for this is their lack of familiarity with these databases and the difficulty of tracking down the clinical evidence quick enough. Even if they have found the evidence (the barrier of obtain full text aside), many still have difficulty in critically appraising the research articles. Pre-appraised electronic resources that have high validity and clinical relevance are preferred, some examples are given in Box 2.

Box 2: Examples of pre-appraised resources

Clinical Knowledge Summaries (PRODIGY).
http://www.cks.nhs.uk/home

Cochrane Library.
http://www.thecochranelibrary.com/view/0/index.html

Cochrane Library Primary Health Care Field.
http://www.cochraneprimarycare.org/

National Guideline Clearinghouse.
http://www.guideline.gov/

Malaysian Clinical Practice Guidelines.
http://www.moh.gov.my/cpgs

Database of questions and answers

Over the years, enthusiasts in medical informatics have started "answering services" as a possible solution to unanswered clinical questions.[21,22] Examples of these free services are:

- PrimeAnswers. http://primeanswers.org/
- Sumsearch. http://sumsearch.org/
- Trip Database. http://www.tripdatabase.com/

When a query in entered, the system generates an extensive list of links from primary research (e.g. randomised controlled trials or systematic review) as well as review articles and clinical practice guidelines. The advantage of these services is that a single query will retrieve multiple possibly useful links that can be checked further by the searchers. However, to evaluate the information found, the users will need to spend some time reading up the references, thus they are not immediately useful at the point of care.

Putting it all together

There is now greater than ever availability of good

diagnostic tools and effective treatment modalities. This occurs in tandem with increasing clinical complexity due to population aging (and multiple co-morbidities) and heighten patient expectation. The public now demands better efforts on the part of the clinicians and healthcare organisation to ensure the best possible quality of care while ensuring patient safety.

The information explosion in medicine in recent years forces primary care physicians to be more selective in their reading to keep up to date. It also means that many of the "facts" that doctor learn in undergraduate or postgraduate education will prove to be untrue. The pace of medical progress and its rapid dissemination via internet and social media means that it is now too premature to dismiss a treatment suggestion offered by the patient before checking it up properly.

Clinical decision support system, if available, will be a great boon to busy clinicians. In most developing countries, there is as yet insufficient funding to support this. Policy makers will need to redress the relatively low financial investment of information technology in healthcare in comparison with other industries.[23] If the healthcare organisation and individual user can afford the small subscription fee, a point-of-care resource with the continually updated electronic textbook will facilitate just-in-time quick retrieval during clinical consultation. Internet access within the consultation room is still not a common feature in primary care in the developing world. This means web-based point-of-care resources and other online services will be mostly out of reach.

On the other hand, it is common to find a computer in most primary care clinics. It is useful for the clinicians to maintain a collection of clinical resources that support clinical practice (e.g. locally developed clinical practice guidelines, monograph, protocol and journal articles about local medical conditions). This collection can be created collaboratively and shared by all clinicians working in the same clinic. As the number of electronic items get bigger, it is advisable that users get a reference management software, which may have web-based or desktop (or both) versions. Some freewares are also available (refer to Wikipedia: Comparison of reference management software).

Medical knowledge is rapidly evolving. There are many questions in primary care for which answers have yet to be found.[24] The complexity of patients also means that evidence derived from published sources is an important guide but insufficient by itself; clinicians will continuously need to make sense of the clinical evidence (explicit knowledge) as well as to personalise its application in clinical care using the less well defined tacit knowledge.[25,26]

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