CME Article

Health technology assessment

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ABSTRACT

Health technology assessment (HTA) involves the systematic evaluation of healthcare technologies and the dissemination of assessment findings. Its main purpose is to provide objective information to support healthcare decisions and policy-making. This article provides a brief overview of HTA, covering availability of assessment reports, approaches used, relevance and reliability of assessments and the influence of HTA. HTA reports vary greatly in their scope and complexity, because of the range of questions considered and the needs of those who request advice on health technologies. A key to the reliability of an HTA report is its transparency. Explicit information should be provided on the question that is addressed, data used, approach to analysis, and any assumptions that are made. Effectiveness of HTA – the extent to which it influences decisions – will be highly dependent on how well assessment findings are disseminated.

Keywords: decision-making, health policy, health technology assessment

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INTRODUCTION

This article gives an overview of some aspects of health technology assessment (HTA), an area that draws on many of the evidence-based medicine (EBM) aspects that have been discussed in earlier articles in this series[1-4]. Decision-makers in healthcare have to make informed choices on which technologies they should support and how these should be used. HTA is an approach that can help in the consideration of such issues. It involves the systematic evaluation of the properties, effects and other impacts of healthcare technologies. Its main purpose is to provide objective information to support healthcare decisions and policy making.

For the purposes of HTA, health technologies are defined broadly and are taken to include drugs, devices and medical procedures as well as the organisational and other systems for the delivery of healthcare services. The two major components of the HTA process are preparation of an assessment product – often a detailed report of some kind – and dissemination of the findings and conclusions of the product. Those who undertake HTA have therefore to both produce good quality analysis and to use this material effectively to influence decision-makers in healthcare systems.

Stages in development of the HTA product include comparison of the health technology with an alternative approach, identification and retrieval of information from the literature and other sources, and then critical evaluation of the retrieved information. There is typically a synthesis of the evaluation findings, bringing together different types of information. Finally, there will be formulation of conclusions and, possibly, recommendations.

An assessment may consider many aspects of a technology, including the attributes shown in Table I. If all these attributes are considered in detail (assuming time and resources permit), a comprehensive description of the technology will be available. However, this may not necessarily be required and HTA reports are often more narrowly focused. This gives an indication of the flavour of HTA; typically assessors are responding to a question or a need that is in some way specific to decision makers in a health system. In addition to a synthesis of data and associated conclusions, an assessment may be drawing inferences and making suggestions for consideration by the decision maker on the basis of limited evidence.

WHO DOES HTA?

Health technology assessment is carried out by many organisations and individuals, but work from programmes established specifically to do HTA tends to be particularly significant in terms of

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Table I. Attributes of health technologies that may require assessment.

Safety	Information on harm or adverse effects of the technology considered by regulatory agencies and also safety issues associated with procedures and with effects of technology on overall process.
Efficacy	The performance of a technology under "ideal" conditions or conditions of best practice.
Effectiveness	The performance of a technology under "routine" conditions, for example when it has become widely distributed in a healthcare system.
Economic impact	Costs of a technology are of immediate interest for healthcare budgets, but HTA will often be concerned with economic costs and benefits, and in judgments as to whether a technology is good value for money.
Equity	The extent and distribution of access to a technology.
Ethical issues	The consequences of the technology for the well-being and rights of those whom it might affect.

Table II. Sources of information on HTA reports.

- The website of the International Network of Agencies for Health Technology Assessment (www.inahta.org) provides useful contact information on its members (43 HTA organisations in 21 countries), and downloadable HTA publications.
- Accessible through the INAHTA website is the HTA database maintained by the NHS Centre for Reviews and Dissemination in England (www.york.ac.uk/inst/crd). This is a useful resource when searching for assessments that have been undertaken on particular technologies.
- US – Blue Cross and Blue Shield Association. Technology Evaluation Center (TEC) (http://www.bcbs.com/tec): Includes assessment reports and information on assessments in progress.
- The EuroScan network provides information on new and emerging health technologies for a subset of its publications that are available to non-members (http://www.euroscan.bham.ac.uk).
- Ministry of Health, Malaysia – HTA reports and a list of current assessments (http://www.moh.gov.my/medical/Project.htm).
- A publication from the Alberta Heritage Foundation for Medical Research, Health Technology Assessment on the Net: a guide to internet sources of information, includes a range of information on HTA publications (www.ahfmr.ab.ca/hta/hta-publications/infopapers/Internet_sources_of_information.pdf).
- The International Journal of Technology Assessment in Health Care, published by Cambridge University Press, includes papers dealing with recent assessments and a wide range of HTA issues.

expertise available and the range of topics that are covered. A prominent group comprise the organisations that form INAHTA – the International Network of Agencies for Health Technology Assessment (http://www.inahta.org). These organisations are funded principally from the public sector and focus on provision of advice to governments, though there may also be other types of clients.

Other important players in the production of HTA include government-advising groups outside INAHTA, such as the Malaysian HTA programme, and health insurance programmes, such as Blue Cross/Blue Shield in the USA. There is also much HTA-related work within the manufacturing industry, though often this will be commercial in confidence and reports may not be generally accessible. Table II lists some sources of information on HTA reports. Those from the INAHTA group are a major information resource and many of their HTA products are available free of charge.

HOW RELIABLE AND RELEVANT ARE HTA REPORTS?

HTA reports vary greatly in their scope and complexity. The HTA report will reflect the question about the health technology that has been raised and the data, time and resources available. If an HTA report is to help in decision making, to what extent can it be relied on? Important considerations are the accuracy of the information in the report and the context in which the assessment has been undertaken. A key to "assessing the assessors" is the transparency of the report.

These points have been considered by INAHTA, which has developed a checklist[5] intended as a guide both for those who use HTA reports as a source of information and for those who prepare such documents. For those reading reports prepared by other organisations, the checklist gives guidance on what to look for in an HTA report. It should be seen as complementary to more detailed guidelines for assessment of health technologies, such as those prepared by the Danish Center for Evaluation and Health Technology Assessment[6]. The questions from the checklist are shown in Table III.

The questions in the INAHTA checklist point to some important aspects of preparing an HTA report. The preliminary points indicate the need for transparency on who prepared the report and of any potential conflicts of interest they might have had. External review of a report tends to improve its quality and credibility; it is helpful to include

names and affiliations of persons who have provided comment during preparation of the assessment. A concise summary is a highly desirable feature of an HTA report. This is a major aid to getting the message of the assessment across to a wider audience. The summary might cover the purpose and scope of the assessment, the approach taken, leading results and include clear conclusions.

The context of an HTA report is important. Reports should specify why an assessment has been undertaken, the relationship of the question considered to the healthcare system, and the population for which the technology is intended. Information should be given on which attributes of the technology are addressed. A short description of the technology and brief reference to alternative approaches will be helpful for the general reader.

Details then need to be given of how the assessment was carried out. Those undertaking an assessment will need to consider how to undertake a search for relevant literature, using the approaches covered in an earlier article in this series[2]. Databases to be used, years covered and any language restrictions will be important issues to address. It will also be important for assessors to consider and report on other sources of information, such as cost or administrative data, with comment on their scope and accuracy.

The process used in selecting material for assessment needs careful planning. The basis for selection should be clear – for example, consideration of study design and numbers of subjects, with an indication of why the selected papers have been chosen and not others. Accuracy and consistency in data extraction are extremely important. Errors can be minimised by designing data extraction forms with clear instructions and using at least two reviewers to perform data extraction independently.

The basis for interpretation of the selected data then needs to be defined. The HTA report should describe results of relevant studies and consider their quality and limitations. There should be an indication of how these results have been synthesised; the approach taken to any non-quantitative synthesis should be outlined. If a cost or economic analysis is undertaken, details of methods used and assumptions made are required.

Presentation of results will include a synthesis from the analysis of material selected for assessment, including estimates of uncertainty. There should be some indication of how the results have been interpreted. It will be helpful to include comment on their likely relevance to clinical practice and to the healthcare system.

Table III. Questions to ask about an HTA report[5].

Preliminary information

Is there:

- Appropriate contact information?
- Identification of who prepared the HTA report?
- A statement regarding conflict of interest?
- A statement on whether the report has been externally reviewed?
- A short summary that can be understood by the non-technical reader?

Why the assessment has been undertaken

- Is reference made to the question that is addressed and the context of the assessment?
- Is the scope of the assessment specified?

How the assessment has been undertaken

- What sources of information have been used?
- Is there information on the process for selecting material for assessment?
- Is there information on the basis for interpretation of selected data?

Results of the assessment

- Are the results of the assessment clearly presented?
- Is there interpretation of the assessment results?

Implications of the assessment results and conclusions

- Are the findings of the assessment discussed?
- If relevant to the assessment, are medico-legal implications considered?
- Are the conclusions from the assessment clearly stated?
- Are there suggestions for further action?

The last items on the INAHTA checklist deal with presentation and discussion of the assessment results that have been obtained. Matters to address include the relationship of the results obtained to the question that has been addressed, missing or uncertain information, and the reliability of the analysis. Any assumptions or opinions that have contributed to the position taken by the assessment should be identified. The nature and basis of judgments taken in the absence of definitive data on the performance of a technology should be made explicit. The reader of the assessment should be given a clear account of what has been done, what has been assumed and what has not been done.

The report should reach clear conclusions that follow from the evidence that has been reviewed. It may be helpful to include discussion of gaps in available information, directions for future assessment and approaches to dissemination of findings. It may also be useful for HTA reports to address the implications of their findings for policy, where such analysis is within the mandate of the assessment organisation.

The relevance of even a transparent and reliable HTA report to the question of interest will vary. Assumptions and data used in the assessment may not be closely applicable to local healthcare services; the assessment (and the studies it has used) may not have considered the exact question that is being raised. Variations may occur, for example, with organisations of health services and with societal perspectives. Material in the HTA report may need to be supplemented by other (local) studies.

WHAT SORT OF APPROACH SHOULD BE USED?

Much of HTA is concerned with secondary research, providing a synthesis of primary studies, and use of systematic reviews is widespread. However, the approach taken will reflect the question raised. Granados[7] has illustrated the use of different approaches in HTA to assist clinical decision making with examples from the Catalonian HTA program. Process variables associated with oxygen therapy were addressed through a local survey of patients. Examination of varying quality of cardiac surgery at different centres was assisted by use of risk-adjusted mortality analysis. Future use of low osmolar contrast media was assessed using a systematic review and cost effectiveness analysis, and a systematic review was used to assess the efficacy of the transmyocardial laser for severe coronary disease.

Secondary research, through review of the literature, may alternate with primary studies. Introduction of magnetic resonance (MR) imaging in Australia was informed by a synthesis report by the national HTA body, which recommended local evaluation before any widespread diffusion was contemplated. This position was accepted by governments and led to a study at five public hospitals on efficacy and costs of MR imaging. Results of the studies were later used in a further review-based HTA report to governments[8].

WHEN SHOULD ASSESSMENT BE UNDERTAKEN?

Questions may need to be addressed by HTA throughout the lifetime of the technology. Often there is a focus on health technology in its early stages – HTA being helpful to decision makers dealing with potential changes in expenditure, practice patterns or distribution. A challenge with new technology for the assessor is that only preliminary data will be available. This is an area where judgments are often needed, perhaps associated with conditional support for use of the technology where further studies or data collection are required.

An interesting step in the assessment of new health technologies has been development of so-called "horizon scanning" programmes, intended to provide advice on emerging technologies, ideally before they reach the market place. Prompt advice regarding the potential impacts of the introduction of a new modality can allow time to consider approaches to handling the technology within a healthcare system, including the initiation of further HTA, where appropriate. The National Horizon Scanning Centre at the University of Birmingham hosts the secretariat for EuroScan, a group of agencies that produce reports on new and emerging technologies for their respective funding bodies. The reports vary between agencies; some are short briefing papers, while others are lengthier documents that include systematic reviews of evidence. Many of these can be accessed through the Euroscan website (Table II) which is a useful source of advice on newer developments in health technologies and critical appraisal of preliminary information on them.

With some technologies, effectiveness and safety aspects may take some time to be fully resolved. Longer-established health technologies may become associated with new indications. Some of them, for example, cancer screening technologies and programmes, come under continuous review, new assessments being prompted by evolution of test methods, results from longer term trials and information on the effectiveness of healthcare organisations. Some very old technologies with multiple potential applications, and limited data on effectiveness, such as hyperbaric oxygen therapy and stereotactic radiosurgery, continue to attract attention.

DOES HTA INFLUENCE ANYTHING?

The influence that an HTA report will have is very dependent on the dissemination process – getting the message to the decision maker. Decisions will be influenced by many other factors; and for influence on healthcare to occur, the decision maker has to have both the mechanism and the will to implement changes, or maintain the status quo.

There is a need to "sell the message". Points to consider are, who is to be told about the assessment, what is to be said and what method of communication to use. It is desirable to build in consideration of dissemination requirements from the start of an HTA project.

What sort of message should be disseminated? The clearest situation is dissemination of evidence or findings on clinical effectiveness. The concept of how well a technology works and whether it is safe will be picked up by many target groups. The message from economic evaluation may be more difficult to impart. There is the question of what proportion of a possibly complex assessment should be disseminated widely. A summary, drawing attention to the main issues and giving information on sources of further data, will often be a useful approach. There may well be a need for different formats for different targets.

Vehicles for dissemination then have to be chosen. Mail-outs and presentations in journals are common approaches, but are relatively inefficient and not very interactive. Use of the Internet offers advantages of speed of transmission of findings, and potential for dialogue. A mixed strategy may often be appropriate, using several approaches, but will tend to be demanding of resources and of expertise.

In some cases, HTAs inform government decisions within a well-defined administrative framework so that there is clearly an influence. For example, in Australia there is a well-established process for using economic evaluation to inform decisions on whether to provide government funding for new drugs through the Pharmaceutical Benefits Scheme. In this case, assessment is used routinely to inform policy decisions. This successful use of economic analysis is linked to availability of a well-developed framework for evaluation with a link to legislative provisions and defined responsibilities within a government programme[8].

Appraisal of HTA influence when there is not an immediate machinery link to a regulatory or other process is more difficult, and so far there have been few reports in the literature that look in detail at this issue. There is an inherent difficulty in determining exactly how information from an HTA is used in decisions on healthcare, and detailed exploration of influence is really a research topic in itself.

One of the most detailed studies conducted to date considered the impact of HTA in the Québec health system. Interviews, questionnaires and databases were used to describe the influence of 21 assessments[9]. All but three of the reports were considered to have influenced policy. In one group of HTAs, the principal targets were health professionals and the focus was cost minimisation through policy on hospital service utilisation rules (e.g. low osmolar contrast media, hemodialyser reuse and routine chest radiography). Estimated cost savings as a result of using the HTA findings were identified (between C$16 million and C$27 million per year). With the other group of reports, the objective was to optimise diffusion of the technology through information provided to the health ministry (e.g. bone marrow transplantation and prostate diathermy). Most of this group of reports had been commissioned by the ministry and had a major impact.

Most other reports of HTA influence have relied on less detailed studies but useful indications have been reported in a number of cases. In the examples from Catalonia, given earlier[7], work on oxygen therapy led to development of practice guidelines and changes to regulatory requirements; there was reallocation of human resources at some centres following the cardiac surgery appraisal; selective use of low osmolar contrast media was implemented, with reallocation of funds at a teaching hospital; and funds were allocated for further research on the transmyocardial laser because of the poor level of evidence available in the literature.

Local studies were also an important factor in the influence of the Australian assessments of MR imaging on policy for government support for the technology at centres with major neurosurgical responsibilities[8]. The assessments were also useful input to development by the Royal Australasian College of Radiologists of guidelines for the use of MR imaging.

Detailed HTAs, undertaken over months or even years, will be important to address certain sorts of questions, but rapid assessments may be needed and can often exert important influence. A review of rapid assessments undertaken by the Alberta HTA program in response to urgent requests for advice[10] found that 14 had an influence on policy and other decisions, four provided guidance and two others had no apparent impact. There were four policy-related areas: referral of patients for treatment outside the province (for example, cryosurgery for prostate cancer); introduction of new types of technology (peripheral stem cell transplantation as an alternative to bone marrow transplantation); purchasing decisions by hospitals (ultrasound measurement of post-void residual urine volume); and whether current clinical practice for existing technologies was appropriate (sex reassignment surgery).

These examples of successful HTA projects have some common elements. In each case there were clearly specified questions to address, appropriate evaluation methods, timely responses

by the assessment programmes, and exchange of information both with healthcare professionals and policy areas.

CONCLUSION

HTA is now well established in many countries and is a helpful means of informing a variety of decision makers in healthcare. It incorporates many aspects of EBM, with HTA reports including a systematic appraisal and synthesis of available evidence. HTA provides a pragmatic approach to addressing problems in healthcare and may include judgments on some aspects of technologies when evidence is limited. Linked to the formal assessment of technologies included in HTA reports is the crucial process of disseminating findings. Some aspects of formal appraisal of evidence are well developed. The other side of HTA – dissemination and interaction with decision makers – still faces some challenges.

REFERENCES

1. Pwee KH. Evidence-based medicine and healthcare: what is this thing called EBM? Singapore Med J 2004; 45:413-7.
2. Bidwell SR. Finding the evidence: resources and skills for locating information on clinical effectiveness. Singapore Med J 2004; 45:567-73.
3. Makela M, Witt K. How to read a paper: critical appraisal of studies for application in healthcare. Singapore Med J 2005; 46:108-14.
4. Green S. Systematic reviews and meta-analysis. Singapore Med J 2005; 46:270-3.
5. International Network of Agencies for Health Technology Assessment. A checklist for health technology assessment reports, 2001. Available: www.inahta.org/Reports.asp?name=/ContentII/Dokument/HTAchecklist.pdf. Accessed February 10, 2006.
6. Kristensen FB, Hørder M, Poulsen PB, eds. Health Technology Assessment Handbook. 1st ed. Copenhagen: Danish Centre for Evaluation and Health Technology Assessment; 2001. Available: www.sst.dk/Applikationer/cemtv/publikationer/docs/Metodehaandbog/MethodologyHandbook180601. Accessed February 10, 2006.
7. Granados A. Health technology assessment and clinical decision making; what is the best evidence? Int J Technol Assess Health Care 1999; 15:585-92.
8. Hailey D. Australian economic evaluation and government decisions on pharmaceuticals, compared to assessment of other health technologies. Soc Sci Med 1997; 45:563-81.
9. Jacob R, McGregor M. Assessing the impact of health technology assessment. Int J Technol Assess Health Care 1997; 13:68-80.
10. Hailey D, Corabian P, Harstall C, Schneider W. The use and impact of rapid health technology assessments. Int J Technol Assess Health Care 2000; 16:651-56.

SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200603A)

	True	False
Question 1: Which of the following are health technologies?		
(a) Paracetamol tablets.	❑	❑
(b) Haemodialysis machine.	❑	❑
(c) Appendicectomy.	❑	❑
(d) A disease management programme for diabetics in the community.	❑	❑
Question 2: Attributes of health technologies that may require assessment include		
(a) Possible harm from the use of the technology.	❑	❑
(b) How well the technology works in everyday practice.	❑	❑
(c) How much benefit the technology will bring in relation to its costs.	❑	❑
(d) Whether there are any ethical issues in using the technology.	❑	❑
Question 3: Health technology assessment		
(a) Usually involves trying out the technology directly on patients in your practice.	❑	❑
(b) Of a new technology should compare it with existing standard technology.	❑	❑
(c) Is only carried out by government agencies.	❑	❑
(d) Usually involves critical appraisal and synthesis of evidence from the scientific literature.	❑	❑
Question 4: When reading a health technology assessment report, you should ask:		
(a) Who wrote the report and was there any conflict of interest declared?	❑	❑
(b) What was the clinical question addressed and was the clinical context clearly stated?	❑	❑
(c) Was there appropriate interpretation of the assessment results?	❑	❑
(d) Is it worthwhile to use health technology assessment reports since they are very expensive?	❑	❑
Question 5: Health technology assessment should be performed		
(a) Only when evaluating new and costly technologies.	❑	❑
(b) As part of horizon scanning.	❑	❑
(c) When an established technology is used for new indications.	❑	❑
(d) When introducing a technology may impact significantly on service delivery.	❑	❑

Doctor's particulars:

Name in full:_____

MCR number:_____ Specialty:_____

Email address:_____

Submission instructions:

A. Using this answer form

1. Photocopy this answer form.
2. Indicate your responses by marking the "True" or "False" box ☑
3. Fill in your professional particulars.
4. Post the answer form to the SMJ at 2 College Road, Singapore 169850.

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1. Log on at the SMJ website: URL <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions.
2. Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

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2. The MCR numbers of successful candidates will be posted online at http://www.sma.org.sg/cme/smj by 20 May 2006.
3. All online submissions will receive an automatic email acknowledgment.
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5. The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.