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Evaluation criteria to assess the value of identification sources for horizon scanning

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Objectives: The English National Horizon Scanning Centre routinely scans thirty-five sources to identify new and emerging health technologies. The aim of the study was to develop and apply evaluation criteria and scores to assess the value of sources, and to identify a cutoff score below which sources would be recommended for removal from routine horizon scanning. Criteria to evaluate each source scanned could result in a more efficient approach in the selection process.
Methods: Evaluation criteria were developed following a review of the literature and discussions with horizon analysts. Proposed criteria were piloted on a random selection of six sources, and then applied to all thirty-five sources. The criteria were assessed using the Analytic Hierarchy Process.
Results: Eight criteria were identified as being most relevant for assessing the value of scanning sources. The three most important (primary) criteria were coverage (approximate percentage of relevant information), quality (reliable, accurate, objective), and efficiency (estimated time to identify one potentially significant health technology or other relevant information). Seven sources fell beneath the cutoff score and were recommended for removal from routine scanning.
Conclusions: The criteria were considered useful in the assessment of current sources, and have the potential to be used to assess new ones. These criteria may be useful for other horizon scanning centers to pilot and validate.

Keywords: Horizon scanning systems, Health technology assessment, New and emerging health technologies, Priority setting

Many countries have established systems to support the uptake of new and emerging health technologies. The National Horizon Scanning Centre (NHSC) in England is one such early awareness and alert (EAA) system, and provides advanced notice of new and emerging health technologies and interventions that are likely to have a significant impact on the English National Health Service (NHS) and/or patients, within the next 2 to 3 years (4). The work of the NHSC informs the future work program of the National Institute for Health and Clinical Excellence (NICE), the Health Technology Assessment (HTA) program, and other policy-making bodies.

Horizon scanning involves looking at many different sources of information for scientific developments on the horizon (11). A comprehensive EAA system requires a wide range of scanning sources to ensure adequate coverage of all types of technologies (7). The NHSC scanning program includes over thirty information sources for routine scanning. Scanning sources may be categorized into primary,

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secondary, and tertiary sources (1;7;9). Primary sources provide information directly from developers or manufacturers and the NHSC routinely contacts all major pharmaceutical and medical technology companies to invite them to discuss their pipeline developments, as well as individual contacts regarding specific technologies. Secondary sources are those where some filtering of topics has already been undertaken, and include key medical journals, consultation with experts in the field, and Internet media sources. Tertiary sources provide information from other horizon scanning organizations such as EuroScan, the Australia and New Zealand Horizon Scanning Network (ANZHSN), and the Canadian Agency for Drugs and Technologies in Health (CADTH). This combination of primary, secondary, and tertiary sources provides corroboration, and increases accuracy and coverage of relevant information (2).

The initial selection of NHSC scanning sources was, in part, based on the findings of Robert et al. (7). This early study aimed to determine which types of information sources would be most useful in identifying new healthcare technologies. A list of potential information sources was compiled from existing or previous EAA systems through a Delphi survey, and included: key medical journals (e.g., *British Medical Journal*), the pharmaceutical media (e.g., Scrip, www.scripnews.com) and information directly from pharmaceutical companies.

A more recent study by Douw et al. (2) found variation between individual horizon scanning agencies in their approach to Internet-based sources. The authors found that, whereas horizon scanning agencies remits often differ in scope, on average the same types of information sources and Web sites are used. However, there was little correlation between the individual Web sites that agencies had selected for scanning and therefore judged as important. Currently, new and potentially valuable sources are identified by the NHSC in an *ad hoc* way from current scanning and information sources and through information exchange with other EAA systems and HTA agencies. The NHSC trials new sources informally and subjectively before a recommendation is made to include or exclude the source from ongoing routine scanning. There is a lack of tools to aid horizon scanners to assess new sources identified more objectively, although several authors have attempted to address this.

Robert et al. (7) identified and ranked criteria for assessing the value of potential information sources. These criteria were timeliness, time efficiency, sensitivity of source (the identification of all potential new technologies in the knowledge that many will be false-positives), correlation with other sources, objectivity, depth of source (level of detail), elucidation of likely knock-on effects of the technology (potential impact), specificity of source (the identification of only the most important new technologies), and explicitness of limitations. Sources used in horizon scanning were subsequently rated.

Douw et al. (2) described the importance of devising efficient procedures for the identification of new health technologies. The authors found that Internet sites most attractive for horizon scanning were easy to scan, free of charge, appeared to provide objective information and an email alert service. In terms of frequency of scanning, most sites were scanned weekly or monthly. Thygesen et al. (10) aimed to develop a list of prioritized Web sites that would be easy to search and provide trustworthy, accurate and valuable information. Inclusion and exclusion criteria were developed based on the literature and applied to a variety of potentially relevant Web sites. The criteria related to relevance to specific clinical indications, user-friendliness, efficiency of searching, and quality/reliability-related criteria. A pilot study undertaken by Perras and Topfer (5) aimed to determine which current CADTH sources were most useful in terms of the identification of new drugs, cost and ease of access, and to suggest which sources should no longer be scanned. Key characteristics of sources related to publication frequency, annual cost, accessibility, and number of relevant "hits." One limitation of this study was that sources were not compared for the quality and quantity of the information included in their coverage.

We aimed to develop and apply a set of evaluation criteria to the current NHSC sources. The objective was to identify a cutoff score below which sources would be recommended for removal from routine horizon scanning. The rationale for the work is that developing a set of evaluation criteria could result in a more objective approach in the selection of sources to scan, thereby increasing the efficiency of scanning time.

METHODS

A review of the literature, using MEDLINE, EMBASE, PubMed, international horizon scanning and HTA agencies, and Google, identified papers that potentially discussed quality criteria and inclusion/exclusion criteria. Keywords used included: "Horizon scanning systems"; "Search strategy"; "Priority setting"; "New and emerging health technologies"; "Systematic scanning" and "Health technology assessment". Draft evaluation criteria were developed based on the collated literature, and discussions with NHSC horizon analysts (Table 1). A scoring structure was devised to try to ensure the criteria could be applied in a more quantitative way. We used the Modified Portsmouth Scorecard (6), developed to aid the commissioning of healthcare services to prioritize and guide decision making, as the basis of our scoring system. The Modified Portsmouth Scorecard enables scoring and prioritization of health services and interventions according to locally developed preselected criteria often including cost, benefit and the level of evidence of benefit or harm. A pilot study to test the practicality of the criteria and initial scoring system was undertaken in February 2008, using six of the NHSC's thirty-five current sources selected at random. NHSC horizon analysts used the criteria and scoring system

Table 1. Draft Evaluation Criteria

Factor	Description
Accessibility of information	Level of effort required, e.g., automatic email alerts, Internet sites or email alerts that require link/registration, printed sources/manual scanning
Contact point	Contact details for further information
Cost	Level of annual subscription or registration cost
Coverage	Approximate percentage of relevant information in source
Efficiency of information search	Estimated time to identify one potentially significant health technology or other relevant information
Frequency of scanning	Based on how often the source information is updated, e.g., daily, weekly, monthly
Memory	News archive
Quality of information	Accuracy, objectivity, reliability

Table 2. Evaluation Criteria, Scores, and Recording System

	Usefulness to horizon scanning				
Factors and description	Very low 0 points	Low 10 points	Moderate 20 points	High 30 points	Score
Accessibility of information: level of effort required	Limited access	Resource intensive: manual scanning of literature	Medium effort: Internet sites, keyword search	Minimal effort: automatic email alerts, links to articles	
Contact point for the source: contact details for further information	No	–	–	Yes	
Cost: level of annual subscription or registration cost	>£1,000	£500–1,000	<£500	Free access	
Coverage: approximate percentage of relevant information in source	<10%	10–50%	50–70%	>70%	
Efficiency of search: estimated time to identify one potentially significant health technology or other relevant information	>1 hour	30–60 minutes	10–30 minutes	<10 minutes	
Frequency of scanning: how often the source information is updated	Yearly or less	Quarterly	Monthly	Daily, twice weekly, weekly, bi-weekly	
Memory: news archive	None	<3 months	3–6 months	>6 months	
Quality of information: should be reliable, accurate, objective	No quality	Questionable quality, elements of bias	Accurate, reliable	Accurate, objective, reliable, author cited	
				Total score:	

to assess the six sources. Feedback from the horizon analysts was used to further develop the categories, scoring, and recording system. The final set of evaluation criteria and scores (Table 2) were used by horizon analysts to assess the value of all thirty-five scanning sources in the NHSC horizon scanning program. As part of the recording system, the horizon analysts were also asked to record their opinion as to whether a source should continue to be scanned or not. The final scores assigned to each source were summed and the sources were ranked. The maximum total score possible for a source was 240. The cutoff score was identified by using the scores and horizon analyst opinion on the value of the source.

Four experienced horizon analysts assessed the relative importance of the eight criteria using the Analytic Hierarchy Process (AHP) (8). The AHP, developed by Thomas L. Saaty in the 1970s, is a structured technique based on mathematics and psychology for breaking down and evaluating complex decisions. The AHP is a structured framework to systematically evaluate criteria, comparing them in pairs, using judgment (individual or group) of the criteria's relative importance. AHP converts these evaluations to a numerical value or "priority" and this indicates the criteria's relative ability to achieve the "decision goal," that is, which criteria are the most important in assessing scanning sources.

RESULTS

The AHP "priority" derived for each of the eight factors is shown in Table 3. The higher the "priority" the higher the

Table 3. Criteria Ranked According to AHP Priority

Horizon analyst 1	AHP priority	Horizon analyst 2	AHP priority	Horizon analyst 3	AHP priority	Horizon analyst 4	AHP priority
Coverage	0.34	Coverage	0.35	Coverage	0.29	Efficiency	0.31
Quality	0.26	Quality	0.27	Quality	0.28	Coverage	0.23
Efficiency	0.16	Efficiency	0.15	Efficiency	0.17	Quality	0.14
Access	0.09	Access	0.08	Access	0.10	Frequency	0.11
Frequency	0.07	Frequency	0.07	Frequency	0.07	Access	0.09
Cost	0.04	Cost	0.03	Cost	0.05	Memory	0.06
Memory	0.03	Memory	0.03	Contact	0.03	Contact	0.04
Contact	0.02	Contact	0.02	Memory	0.02	Cost	0.01

AHP, Analytic Hierarchy Process.

relative importance of the criteria. The most important criteria for each of the horizon analysts were coverage, quality, and efficiency, followed by accessibility and frequency.

A cutoff score of $\leq$100 was selected. The thirty-five sources with their scores are set out in Table 4. Seven sources fell beneath the cutoff score of $\leq$100 and were recommended for removal from the NHSC horizon scanning program.

DISCUSSION

We succeeded in developing evaluation criteria that were considered useful by the NHSC horizon analysts in assessing the value of current sources. As a result of our work, seven sources were removed from the NHSC horizon scanning program. From the NHSC perspective, the criteria could be categorized as primary (essential), for example, coverage, quality, and efficiency; and secondary (useful but less important), for example, accessibility, frequency of update, cost, memory, and contact details. Cost, for example, is not necessarily an individual concern as often a hosting institution (e.g., a university or health service) funds a source. Of course, for another HTA or EAA system with different funding arrangements or amounts, cost may well become a primary criterion.

The main limitation of this study was that the evaluation criteria were used by individual horizon analysts to assess their own assigned sources, perhaps leading to a subjective analysis of the source. Some high scores were unexpected. Two key medical journals, the *Lancet* and the *Journal of the American Medical Association* (*JAMA*), had scores of 210. Although there is no doubt that these sources provide high quality information, the high scores may be surprising, as they do not routinely yield a high number of "hits" for new and emerging health technologies. However, this study only took into account one horizon analyst's opinion of each source and when scoring, individuals may have made comparisons within their group of sources with no mechanisms for comparison of sources between horizon analysts. In addition, in terms of source "efficiency," the time to find potentially relevant technologies and/or information will inevitably vary between individual horizon analysts and improve as experience is gained in scanning a specific source.

It will be necessary to further validate the criteria within the NHSC, by selecting a group of horizon analysts, assigning to them all a random selection of current sources for a set period of time (e.g., 4 to 6 months), and then asking them to assess their value. Such an exercise would require a substantial amount of individual time, duplicate scanning activity and may not take in account relative scanning experience within the team. For example, individuals may have more experience in scanning for drugs, than medical devices and diagnostics. So sources may need to be stratified, further increasing the complexity.

The study results could have been enhanced by the use of more qualitative methods such as interviewing experts and specialists in the field, perhaps using a Delphi questionnaire method, or by using artificial neural networking to recognize complex patterns in data.

There were similarities between our criteria judged as important, and the criteria identified in the four other studies (2;5;7;10). The common criteria were accessibility (or ease of scanning), cost, efficiency, frequency, and quality (i.e. reliable, accurate, and objective information). We did not, however, measure the number of relevant "hits" for individual sources as Perras and Topfer did. Adding this could have increased the objectivity of our recommendations for removal. The evaluation criteria and scoring have the potential to be used as part of a more systematic and objective approach to the selection of identification sources, and its value needs to be established through future use. Since this study, the criteria have been tested on a new source. Formulary (3) was trialed for 3 months by a horizon analyst, who then used the criteria to assess the value of the source. The total score fell beneath the cutoff score, and it was rejected as a routine NHSC source.

It will be important that the evaluation criteria and scores are reviewed regularly to ensure that they are up-to-date and relevant to evolving NHSC requirements and a review of current sources could become a regular exercise.

Table 4 Total Scores for Each Scanning Source

Source	Web address	Total score
PharmaTimes	www.pharmatimes.com	220
Lancet	www.thelancet.com	210
Journal of the American Medical Association (JAMA)	www.jama.ama-assn.org	210
Pharmaceutical Marketing (PM) Live	www.pmlive.com	210
Medgadget	www.medgadget.com	210
Clinica - magazine	www.clinica.co.uk	200
Doctor's Guide	www.docguide.com	200
Gene Therapy Advisory Group	www.advisorybodies.doh.gov.uk/genetics/gtac/publications.htm	200
Press Watch	www.presswatch.com/health/	190
Clinica - daily alert	www.clinica.co.uk	190
National Electronic Library for Medicines - Headlines	www.nelm.nhs.uk	180
Scrip	www.scripnews.com	180
ECRI - monthly newsletter	www.ecri.org.uk	180
ANZHSN Bulletin	www.horizonscanning.gov.au	180
UKMI New Product Evaluations	www.ukmi.nhs.uk	170
British Medical Journal	www.bmj.com	170
EuroScan	www.euroscan.bham.ac.uk	160
CADTH - Health Technology Update	www.cadth.ca	155
Future Prescriber	www.futureprescriber.co.uk	150
California Technology Assessment Forum	www.ctaf.org	150
EMEA orphan drugs	www.emea.europa.eu	145
New England Journal of Medicine	www.content.nejm.org	140
International Hospital Equipment and Solutions (IHES) – email alert	www.ihe-online.com	140
MEDICA	www.medica.de	140
IVD Technology	www.devicelink.com	132
Clinica Diagnostics	www.clinica.co.uk	130
IHES - magazine	www.ihe-online.com	130
Radio 4 Today and World Tonight	www.bbc.co.uk/radio4/news/	110
British Cardiovascular Society	www.bcs.com	100
Food and Drug Administration (FDA)	www.fda.gov	100
Science Daily	www.sciencedaily.com	100
Saturday Times	www.timesonline.co.uk	90
Radiological Society of North America	www.rsna.org	90
Dial-Paediatric Drug (Medicine) Information Advisory Line	www.dial.org.uk	80
European Congress of Radiology	www.myesr.org/cms/website.php	60

CONCLUSIONS

The relevance of this work may be limited to comprehensive EAA systems that have a wide focus in terms of topic coverage. However, this study should serve as a starting point for discussion between all EAA systems (comprehensive or more focused) to develop, pilot, and validate common evaluation criteria to determine the value of sources. This could lead to the development of a common list of valuable sources, although the decision of which sources to scan will ultimately depend on the particular remit of the individual EAA system. It is recognized that different regions of the world will have access to different sources and that some sources will be more relevant to different regions, for example, the UK Gene Therapy Advisory Group and the USA Food and Drug Administration (FDA). Furthermore, the selection of sources to scan may also be cost dependent as some EAA systems may pay full subscription/registration costs, whereas others may be partially or fully funded through the institutions employing or hosting them. However, this type of assessment may be valuable as part of a process for efficiently assessing current sources and selecting new ones to scan.

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CONFLICT OF INTEREST

All authors report having no potential conflicts of interest.

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