

The societal impact of applied health research

Koninklijke Nederlandse Akademie van Wetenschappen

The societal impact of applied health research

Towards a quality assessment system

Council for Medical Sciences
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Summary

In addition to scientific quality, societal impact is an explicit objective for important areas of applied health research. The current methods for evaluation of the scientific quality of health research are in principle satisfactory. In the Netherlands, the Council for Medical Sciences of the Royal Netherlands Academy of Arts and Sciences has executed such evaluations several times, according to a widely accepted methodology. Recently, a new national system of quality assurance for all academic research has been introduced, based on self-assessments and site visits. An accepted methodology for the evaluation of the societal impact of applied health research, however, was until now not available. The latter type of evaluation should be complementary to the evaluation of scientific quality in the sense that scientific quality is a *sine qua non* and that societal impact is, for applied health research, an important additional requirement. The Council for Medical Sciences considers the development of such a methodology of importance, since this would be an incentive for investigators to improve their performance in this respect and would avoid societal impact being considered as not more than an optional element.

The present report represents a general outline for an evaluation methodology of societal impact of applied health research, including potentially suitable indicators, as a basis for further specification and development. In short, the following procedure is recommended:

The evaluation of societal impact should be included in the new national quality assessment system which will come into force in 2003. One single external review committee should evaluate both scientific quality and societal impact. The research

mission is indicative for how and to what extent societal impact of the research should be evaluated. Where applicable, research institutes or groups are asked to list and describe in the self-assessment report the indicated output they consider relevant in realizing their societal mission.

Elements that are relevant when assessing societal impact are:

- a. the mission of the research team or the institute;
- b. its performance in relation to that mission;
- c. the prospects for the future;
- d. recommendations for adjustments, where appropriate.

Relevant output categories and a qualitative description of indicators of societal impact for various possible applications are listed in the report.

Before finalizing the report, the Council for Medical Sciences discussed it with an international forum of researchers and experts in the field of research quality assessment. In this meeting it was concluded that the new national procedure for research assessment offers ample possibilities to include an evaluation of the societal impact of applied health research. Most criteria listed in the report can be easily implemented as part of the self-assessment.

The issues dealt with in this report apply to those areas of health research, where an explicit part of the mission is to ensure that the research findings can be applied within the foreseeable future. However, given the broad scope of applied health research, the report more specifically focuses on health care research. Even so, the recommendations can be seen in a wider perspective.

Background

Introduction

In February 1998 the Executive Board of the Council for Medical Sciences (formerly called Medical Committee) was approached by one of its members, Prof J.A. Knottnerus, who pointed out that there was no accepted methodology for evaluating important areas of applied health research, in particular health care research, as to its societal impact. The Board was asked to consider developing such a methodology, which would help achieving a balanced assessment and enable the comparison of the performance of many applied health research teams in the Netherlands, complementing and in addition to the customary assessment of scientific quality. The Board responded that it recognized the need for a methodology of this kind and agreed it was important to develop one.

A practical strategy was then devised, resulting in the setting-up of an Applied Health Research Committee, whose remit was (a) to survey methods of measuring and assessing applied health research and any problems this gave rise to and (b) to draw up indicators for future assessments and thus create the basis for an evaluation methodology. The results were to be presented in a report and discussed at a workshop organized by the Council for Medical Sciences and then embodied in practical recommendations.

In this report, after giving a further definition of the subject under study, an inventory is presented of experiences in the evaluation of societal impact of applied health research. Subsequently, possible indicators of societal impact are discussed, and a methodology of assessment of applied health research is outlined.

Definition of the subject

Evaluation of health research has become increasingly important for the prognosis of departments, institutes and individual careers. In the Netherlands, the Royal Netherlands Academy of Arts and Sciences (knav) has played a central role in this context, with its extensive evaluations of and setting the standards for the research output of the eight Dutch medical faculties on a four-yearly basis.^{1,2,3} Both qualitative and quantitative output indicators were used and external peers were consulted. Furthermore, the knaw acknowledges the Dutch research schools, in which the strongest research groups combine their efforts in a thematic programme and organize national PhD courses. After a research school is acknowledged, the research output is critically evaluated by the knaw every five years. The evaluation procedure is based on a peer-review system. Recently, a new national system of quality assurance for all academic research has been developed.²⁸ This system, which is based on self-assessments and site visits by peers, will replace all research evaluations of publicly funded research from the year 2003.

When the Discipline Plan and Discipline Reports on (Bio)Medical and Health Sciences Research were being drawn up (in 1988, 1994 and 1998),^{1,2,3} each time the need was felt for additional methods and criteria for assessing the societal impact of applied health research. Applied health research differs from 'fundamental' (bio)medical research in its dual mission, which is both scientific and societal: it is explicitly concerned not only with the acquisition of scientific knowledge as such but also with the usefulness and implementation of scientific achievements. So, relevance to society is an important explicit objective of applied health research and evaluation should, therefore, not be restricted to scientific quality. A formal evaluation would acknowledge the importance of societal impact of the research at issue. Societal impact may include 'implementable' output that is ready for use as well as 'implemented' output that has already been applied. This kind of evaluation would be an incentive for investigators to improve their performance in this respect and would avoid societal impact being considered as not more than an optional element.

In 1991, the Council for Medical Sciences of the knaw set up a Health (Care) Sciences Committee, whose remit included adopting a position on how to assess the quality of health (care) sciences. Given the relatively close ties between the health care sciences and national systems and factors and the culture of publication, the Committee recommended that, in addition to journals listed in the Science Citation Index or Social Science Citation Index (sci/ssci), a list be drawn up of the principal scientific publication media for this type of research.⁴ This 'blue list' was composed and used for the first time in the evaluation procedure of the Discipline Report 1994,² and it was used again – in updated form – in the Discipline Report 1998.³

While the current methods for evaluation of the scientific quality of research are in principle satisfactory, the development of a new instrument for evaluation of societal impact cannot, however, be detached from the evaluation of scientific quality. The latter type of evaluation should be complementary to the evaluation of scientific quality in the sense that scientific quality is a *sine qua non* and that societal impact is, for applied health research, an important additional requirement.

The issues dealt with in this report apply to different areas of applied health research. An explicit part of the mission of applied health research is to ensure that the research findings can be applied within the foreseeable future, i.e. fairly soon after the research is completed. Examples are applied clinical research and research and development of medical technology. It is not possible, however, to discuss all areas of applied health research in sufficient depth in this report. Therefore, this report predominantly focusses on a part of applied health research that is called health care research. Health care research, in the definition of the Committee, includes research into the effectiveness and cost-effectiveness of health care interventions, care management strategies and guidelines, and health services research. This report discusses aspects of societal impact specific to this area. Although this provides a good example for other types of applied health research, additional analyses will no doubt be needed in other areas of applied health research to develop suitable indicators of its societal impact.

Assessing societal impact: experience in practice

There have been various attempts in the past to evaluate the societal impact of research. The Committee examined these in order to establish what elements could be used in this report.

In 1994 a field trial took place with a quality control system based on visitations, supervised by the Committee for Experimental Visitations of Health Research (bevg), which involved ten institutions and funds in the area of health research. Each visitation comprised a management evaluation and a substantive quality assessment which had to explicitly include an assessment of the *societal and/or applied* value. A set of criteria were drawn up for this latter assessment: the checklist can be found in the Appendix to the Supervisory Committee's report.⁵ In its report the Supervisory Committee concluded that 'Societal relevance is best assessed on the basis of the mission of the organization being inspected. Quantifying the societal value of research, however, is almost a contradiction in terms: its possible value can only be estimated by a properly constituted external review committee.'

nivel (Netherlands Institute of Primary Health Care) in Utrecht was one of the organizations that took part in the bevg field trial, which gave nivel a stimulus by making the societal aspects of research visible and resulted in its developing tools for monitoring and assessing the societal impact of research. Since then, it was decided that self-evaluations will be drawn up every five years for external visitations: these deal with both the scientific and societal aspects of the quality of research. The societal impact of research findings is measured by their implementation through professional journals, publications in the press, invitational conferences and mem-

berships of advisory committees. By yearly consultation with all relevant stakeholders nivel ensures that both individual projects and research programmes as a whole meet the clients' needs. Since January 2000 the research has been certified in line with iso 9001 criteria.

The mission of the **tno institutes** is to enhance the innovative technological strength of industry, commerce and government by means of strategic research, applied research and consultancy. Every four years the institutes undergo an external audit by an international committee of peers designed to assess their knowledge status and market relevance. On the audit committee are scientists and representatives of the most important potential clients. To supplement this, customer satisfaction audits are carried out, focussing on the quality of service and accessibility.

Research in the **universities** has been assessed since 1993 on a disciplinary basis by means of the vsnu's assessment of research quality system. The assessment – which is mainly scientific – of faculty research programmes is carried out by an international committee of peers on the basis of a self-evaluation/report on research achievements during the past five years, stating scientific publications, theses and dissertations, professional journals, patents and plans for the future. This committee looks at scientific quality, productivity, relevance and prospects for the future. The self-evaluation may include a description of the societal or technological relevance of the research, enabling the former to be taken into account in the assessment of societal impact. In fields such as the technical sciences and chemistry the utilization of research (measurable from patents and – in some cases – concrete products) is also taken into account. The most recent assessment of medical research carried out under the auspices of the knaw and vsnu jointly (Discipline Report on (Bio)Medical and Health Sciences Research in the Netherlands 1998³) was done as outlined above. In addition, an evaluation of the organizations' research management was included based on self-evaluation, taking such aspects as mission, infrastructure, financial management and personnel and career policy into account.

Hardly any of the quality assessments of university research published so far deal with the societal impact of the research separately in an explicit fashion, let alone judge it by separate criteria especially developed for this purpose. An exception is the **vsnu assessment of agricultural sciences** (published in February 1999). A supporting study was carried out for this assessment which yielded information on both the scientific and societal value of the research programmes in this field. The study was adapted for a publication of more general interest ('Methodology for incorporating the societal value of research'⁶) and discussed in a workshop,⁷ organized by the National Council for Agricultural Research (nrlo) and the Consultative Committee of Sector Councils (cos). The methodology comprises three parts:

constructing a specific profile for the research programmes – the ‘Research Embedment and Performance Profile’ (repp) –, a user analysis and a feedback to the research programme’s mission. The repp represents the embedment and performance (type and extent of activity) of the research programmes in the relevant societal environment, based on specific indicators classified into five social domains:

- a. *Science and certified knowledge*: the production of knowledge claims for validation by the scientific community (peers);
- b. *Education and training*: the training of researchers and the generation of skills (*embodied or tacit knowledge*);
- c. *Innovation and professionalism*: the production of knowledge with a view to gaining a competitive advantage;
- d. *Public policy*: the production of knowledge and skills for policy or social purposes;
- e. *Collaboration and visibility*: ‘internal’ orientation and performance in the contribution to the research organization’s goals as compared with orientation towards other national and international institutions.

A supplementary user survey of stakeholders then establishes the significance of the research programmes to the stakeholders’ activities. Finally, feedback and evaluation take place on performance in relation to the research team’s mission.

This type of evaluation is designed not so much to yield a comparison of similar teams or institutions as to provide guidance to a team or institution on its future development.

Some other examples of assessment of societal impact can be found in a survey drawn up in 1997 by Rip and Van der Meulen for the Ministry of Education, Culture and Science.⁸

Measuring the societal impact of applied research is a topic in other countries too. **The Royal Academy of Engineering (London, uk)** recently published a report, ‘Measuring Excellence in Engineering Research’,⁹ exploring the development of a methodology for measuring excellence in engineering research. As with applied health research, the evaluation of science and engineering research is a complex process. The conclusion was that excellence in engineering can be identified by five different characteristics:

- a. *Strategy*;
- b. *Mode I research* (fundamental research);
- c. *Mode II research* (applied research);
- d. *Scholarship*;
- e. *Vitality and Sustainability*.

Measuring excellence should not be limited to the quality of published research findings, but is to be found in the combination of these characteristics. In addition to the five characteristics, peer-review is highly regarded and must play a leading role in the assessment process. While the focus of the report is on engineering, it is suggested that the methodology is adaptable to different, more general needs, although the weightings given to different measures will vary across sectors.

To summarize the relevant findings from this survey of earlier efforts and findings, we can conclude the following as to the assessment of the societal impact of research:

- The need for a valid methodology for assessing the societal impact of research is an international issue;
- A research team's mission is indicative for how and to what extent the societal impact of the research should be evaluated;
- A start has already been made on developing some indicators of societal impact of research;
- The extent to which research findings result (or may result) in innovations in care and health care policy has hitherto played little if any part in societal impact assessments;
- Self-evaluation and external audits are important elements in the assessment;
- Feedback from stakeholders and users of research output can make essential contributions to the evaluation.

Analysis of societal impact of health care research and propositions for assessment criteria

Over the past years the evaluation of research output has been almost exclusively focussed on scientific quality and the role of bibliometric analysis of the scientific impact of international research publications has become increasingly important.^{10,11,12} Since consequences of an evaluation can be profound, evaluation of the societal impact of health care research should also be considered.

Societal impact of health care research can be divided into: (1) relevance for health care providers and the process of health care delivery, and (2) relevance for policy makers and the process of designing, implementing and monitoring policy decisions. In assessing the societal impact of research it seems prudent to discriminate between potential (*ex ante*) and realized (*ex post*) societal impact:

- *ex ante* evaluation focusses on the transformation of societal problems into research questions;
- *ex post* societal impact refers to the degree to which research is able to answer research questions, and can subsequently translate the scientific conclusions into practical solutions or policy implications.

The assessment of the societal impact of health care research can be supported by using indicators for the relevance and urgency of the research problem addressed (like burden of disease, the amount of uncertainty with regard to the research question at issue, and the organizational and monetary benefits involved) and the likelihood that the research outcomes will have impact on decision-making and priority setting in health care.¹³

A final objective is, of course, that the health outcome of individuals and the population would be improved. However, evaluating this would be a long term challenge, requiring extensive specific research. In a more general societal impact assessment, therefore, indirect indicators are to be used.

In the next paragraphs various aspects of societal impact will be discussed and possible indicators will be proposed. Not all mentioned indicators will be equally important at the same time. The criteria and indicators used for an evaluation will always be dependent on the mission of a specific research group or institution.

Speaking about societal impact, it is important to note that for many areas of applied health research an important endpoint can be the production of output that is ready and available for implementation and decision-making. In this context, the decision of indeed using such 'implementable' output is a matter of those responsible in the executive professional and policy field. In other research, e.g. especially initiated to solve specific societal problems, the implementation itself should be evaluated ('implemented' output).

Bibliometric analysis of non-indexed journals

The role of non-indexed journals in quality assessments

Bibliometric analyses are, at present, generally based on counting publications or citations to papers published in journals indexed by the Science Citation Index (sci) or the Social Science Citation Index (ssci) of the Institute of Scientific Information (isi). A limitation of such analyses is, typically, that publications in non-(s)sci journals such as, for instance, peer-reviewed national scientific journals, are ignored.^{10,14,15} The percentage of relevant journals which are not included in the (s)sci probably varies per field, and might be the largest in the field of applied health research (as compared with fundamental and strategic health research). In its peer-reviewed evaluation of research output, the knaw has made an effort to remedy this situation by listing non-(s)sci journals which are relevant to health care research in the so-called 'blue list'. The extent to which this has, indeed, made a meaningful contribution to the assessment of the scientific quality of health research, cannot be easily evaluated. Firstly, the 'blue list' appears to be a somewhat heterogeneous collection of non-(s)sci English, Dutch and one French journals, that are not always peer-reviewed and the extent to which they cater for a scientific forum is not always clear. Secondly, the contribution of the listed journals to a bibliometric analysis can only consist of publication counts, as no impact factors for these journals are available and neither are there any counts of the citations to the articles at issue. Thirdly, the 'blue list' focusses exclusively on health care research, thus ignoring other categories of applied health research, for which non-(s)sci publications might be equally important. Fourthly, it can be argued that there will probably be a

strong correlation between the scientific quality of the papers submitted by a department, institute or individual to indexed and non-indexed journals. There is, for instance, some evidence that the scientific quality of randomized clinical trials (rcts) published in the English language is similar to those published in other languages by the same authors, although statistically significant results are much more prevalent among publications of rcts in the English language.^{16,17,18} On the whole, one gets the impression that a bibliometric analysis in the context of peer-reviewed evaluation of scientific quality might in most cases be restricted to (s)sci publications. However, in research fields that to a large extent focus on topics that are specifically of local (e.g. national) interest, such as the study of national law or policy issues, the peer-reviewed part of the 'blue list' media can contribute to a balanced scientific evaluation regarding these topics.

Are publications in national professional journals suitable indicators of societal impact?

Dutch investigators may publish their research output in English for an international forum, but also in their native language.¹⁹ Publications in national professional journals, both peer-reviewed and non-peer-reviewed, seem to play a very important role in the communication of the results of applied health research by Dutch investigators to the workers in the health profession at issue. Consequently, these publications in journals such as the *Nederlands Tijdschrift voor Geneeskunde*, *Huisarts en Wetenschap*, *Tijdschrift voor Gezondheidswetenschappen*, *Tijdschrift voor Verpleegkunde* and *Nederlands Tijdschrift voor Fysiotherapie* may play a central role in realizing the societal impact of the research output of Dutch investigators. Only approximately 10% of physicians in the Netherlands read international medical journals, which suggests that publication in a national professional journal is important if research output is to have any impact at all on daily practice and the quality of health care in the Netherlands.²⁰

There are many examples of a profound societal impact of publications in national professional journals,^{21,22} although it is also true that these partly concern the republication of papers in (s)sci journals. Authors of articles published in national professional journals typically receive many reactions from their colleagues, and are often given some coverage in the lay press. Civil servants and politicians seem to have a similar tendency to favour professional journals in the Dutch language. This clearly enhances the impact of the research output at issue on health policy. In conclusion, counting the publications in national professional journals may provide a crude indication of the societal impact of the research output of a department, an institute or an individual investigator when applied health research is at issue.²³ While the 'blue list' seems to be of moderate importance for the evaluation of scientific quality, the national professional journals included in this list might be very useful for the evaluation of societal impact.

Quality improvement and implementation activities

Quality improvement (qi) is concerned with the systematic and planned approaches aimed at assuring that patients get the best care possible. It includes formulation of guidelines, protocols, indicators and criteria for optimal care, assessment of actual care, and activities aimed at improving care when necessary. Implementation of knowledge is a new concept addressing the systematic and planned process of integrating (new) research findings or valuable procedures and techniques within normal practice routines. It usually includes a review of current research findings, formulation of guidelines for practice, analysis of determinants of and problems related to using the guidelines or research, specific implementation actions or programmes and evaluation of the use of the guideline. qi and implementation of research findings are closely related and have become important research fields themselves. In this respect, indicators for assessing the societal impact of these types of research are also closely related and overlapping. The weighting given to the different indicators for the evaluation of societal impact will therefore vary according to the area of research. Proposed indicators:

a. *Guidelines and protocols*

Widely used methods to implement research evidence are the development and dissemination of clinical practice guidelines and practice protocols. A considerable amount of such guidelines are published in the Netherlands by a variety of organizations e.g. the Health Council of the Netherlands (gr), the College of Care Insurances (cvz), the Dutch Institute for Quality in Health Care (cbo), the Dutch College of General Practitioners (nhg), other scientific societies of physicians, paramedics and nurses, non-academic research institutions (tno, Trimbos Institute, nivel) and hospitals. International guidelines are increasingly seen. The guidelines can be important products of scientific and educational work and should be valued as such. However, not all guidelines are of good quality and, in order to be evaluated positively as a relevant product, the guideline should meet specific quality criteria^{24,25}. Inclusion of research work within systematically developed clinical guidelines or participation in setting up such guidelines can be used as an indicator for the societal impact of research work. Internationally acknowledged criteria for guideline formulation (agree-instrument) may be used in this respect.

b. *Indicators and instruments for assessing the quality of care and use of guidelines*

A specific very important type of tool in the field of qi is concerned with assessing the actual care delivered to patients. A wide variety of indicators, criteria and instruments is used (practice audit systems, surveys among patients or care

providers, videotaped contacts, observation, existing data sources). Seen from a societal perspective these are important products, requiring considerable effort, which can only partly be published in the international literature. Criteria for evaluation of this activity have to do with:

- the systematic development is reported;
- the validity and reliability is reported;
- the applicability in clinical practice and acceptance by the target group are tested;
- the tools are included in a concrete product or instrument used in assessing or improving the quality of care.

c. *Methods and programmes for improving care and implementing evidence or valuable procedures*

The development of a method, strategy, tool or programme to change clinical practice is a very creative and relevant undertaking, that usually is not valued in research evaluations, although it takes considerable time and investment of researchers. Examples: a well tested, interactive programme for Continuous Medical Education (cme), a small group peer-review method, a computer decision-support tool, a method for practice visits to support teams or practices, a reminder system for prescribing, a feedback method on test ordering, etc. Evaluation of the value of such activities can be related to :

- the systematic development and testing of the product is reported;
- collaboration with organizations that are important in spreading the method or product has been achieved;
- dissemination at a wider scale, wide accessibility has been achieved.

d. *Systematic reviews*

Another important product of scientific work with considerable educational impact is (participation in) official review groups, particularly in Cochrane Collaboration Groups. Inclusion of a review in the Cochrane Library can be seen as an indicator of esteem.

e. *Indicators of esteem and key positions in relevant professional networks*

This refers to integration of the research activities within the relevant context, for instance the active collaboration with organizations representing the target groups of the above mentioned guidelines, reviews, instruments and quality improvement programmes and activities.

Relevance of health care research for policy

Health care policy might benefit from health care research in developing rational or evidence-based policy. Utilization of results of health care research by health care policy makers can be *instrumental* (i.e. direct application of results), *conceptual* (i.e. generating new policy ideas) or *strategic* (i.e. having a role in the political process).

Policy is characterized by phases, the policy cycle. The relation between research and policy differs according to these phases. In this respect, research questions as well as the assessment of policy relevance also differ, paralleling the different phases. Additionally, health care research has many different target groups with different interests. The interest of these target groups may change according to *the phase of policy making*.

Areas for the development of 'ex ante' indicators of policy relevance

In a number of areas *ex ante* indicators can be developed which focus on the transformation of societal problems into policy research questions.²⁶

- a. The first area is the *relevance of the policy problem*, which in health care research can be defined in terms of the general goals of the health system, such as coherence, equity and accessibility, and the quality of care in relation to costs.²⁷
- b. Another important area is the *translation of policy problems into research questions* addressing both the exploration of the policy problem and the possible contribution of research to the solution of the problem.
- c. A third area is the *feasibility of conducting research in complex field situation*.

Areas for the development of 'ex post' indicators of policy relevance

Specific indicators can be developed for the degree to which the research output is tuned to the policy arena. For example:

- a. The degree of (semi)-governmental funding of studies, programmes or institutes.
- b. The degree to which results of research reach those who have to use it. Assessment must therefore be focussed on how research output is communicated to the target groups.
- c. The degree to which target groups (could) have had any use of the results, e.g. citation-analysis.
- d. Evaluation of the implementation strategy of an institute or research group.

Other output and products

Apart from publications in national professional journals, clinical guidelines and quality of care programmes, research in the field of health care research may result in other intended products, which can be relevant for health care practice or policy.

One can think of:

- a. ict-facilities and software to be used in (the evaluation and improvement of) health care practice, public health, or in policy development.
Examples are: (contributions to) practice and patient information systems and communication facilities, including their development, evaluation and improvement; and the design, development and implementation of health care information networks to support health policy.
- b. Development, evaluation and improvement of health care technologies and services. For example: home care facilities for intravenous infusions, non-invasive diagnostic techniques applicable in primary care settings, and shared care services.

Based on health care research and expertise, these instruments and products are generally developed, validated and implemented for practical purposes and are often setting-specific. Therefore, their quality and success in terms of impact on health care and policy cannot be satisfactorily evaluated using, for example, bibliographic measures. Also, while there is no tradition of claiming patents in health care research, an exclusively or primarily patent-oriented approach would also not work given the setting-specific and low profit nature of most of this work. Therefore, evaluating patent claims would not cover this output nor its quality or impact.

Independence of research

Since in applied health research interaction between research and contract partners (e.g. governmental and (non)professional organizations) can be intensive, and as the results and the way these are presented are generally of great interest for these partners, special attention is needed to warrant scientific and professional independence of research teams. Clearly, in order to achieve valid results and justified societal impact of research independence is a basic requirement. Whether independence has indeed been warranted, should therefore be part of the assessment. Possible indicators in this field are:

- a. full and independent responsibility of research teams for the operationalisation of the research topic.

- b. full and independent responsibility of research teams for the research methodology used.
- c. full and independent responsibility of research teams for the analysis, production and publication of the results.

Suggested methods and procedures

General approach

Certain prerequisites need to be taken into account when developing a methodology for assessing the societal impact of applied health research. Firstly, the methodology needs to link up closely with the current ways of evaluating scientific research. Secondly, it must not only provide an assessment of the current status and level of the research, it must also enable recommendations to be made for the future. Thirdly, it must be efficient from the point of view of both the researcher and those carrying out the assessment, enabling the necessary information to be obtained efficiently and as quickly as possible. Finally – and crucially –, it must be workable in practice. Elements which are relevant when assessing societal impact are:

- a. the research team's / the organization's mission;
- b. its performance in relation to that mission;
- c. the prospects for the future;
- d. recommendations for adjustments, where appropriate.

The research mission (a) should be clearly articulated, and should be reviewed in the light of both scientific and societal challenges in the field. As to performance (b) it should be considered whether the profile and quality of the research programme and its output are in line with the mission objectives. For (a) and (b), both *ex ante* and *ex post* assessments are important. For (c) and (d), of course, *ex ante* assessment is essential.

Given the breadth of the field, the absence in many cases of standardized and easily accessible sources and performance data, and the need to tailor the approach to specific cases, the Committee does not consider it possible nor useful to produce detailed quantified yardsticks for general use. We shall list relevant output categories and give a qualitative description of indicators for various possible applications. The actual criteria should be elaborated in advance for specific assessments.

Output indicators

Based on the previous chapter the following indicators of societal impact of health care research have been mentioned:

- communication to health professional workers: publications in national professional journals;
- development and dissemination of clinical practice *guidelines* and practice *protocols*;
- *indicators and instruments* for assessing the quality of care and use of guidelines;
- development of *methods/programmes* for improving care and implementing evidence or valuable procedures;
- degree of (semi)-governmental funding of research;
- communication of the research output to societal target groups;
- use of the research output and feedback by the target groups;
- process evaluation of the implementation strategy also considering whether the output should be ‘implementable’, or, where relevant, ‘implemented’
- *ICT-facilities* and *software* to be used in (the evaluation and improvement of) health care practice;
- development, evaluation and improvement of *health care technologies* and services;
- independence of research teams as to operationalisation or research topic, methodology, analysis and publication of results.

Potentially suitable indicators of societal impact are listed in Table i.

Information regarding many of the indicators for evaluation of societal impact is not yet routinely available and will, at least to a certain extent, be difficult and/or expensive to obtain. While, for example, a listing of relevant teaching activities, memberships and authorships can easily be provided by the investigators involved, it will be a time consuming task to make a citation analysis or – even better – a content analysis. Such a citation/content analysis will generally be institute-specific. Therefore key indicators should be detailed for the evaluation of specific groups or programmes. Indicators for evaluation of societal impact will currently be mostly qualitatively assessed. However, development of better quantification systems,

Table 1. Criteria and indicators of societal impact of research output

<i>criterium</i>	<i>indicator</i>
content analysis	professional publications treatment guidelines and protocols (nhg, cbo) policy documents (vws, gr, cvz) Cochrane library textbooks teaching materials lay publications ict and software (Internet/cd-rom)
citation analysis	scientific publications (both (s)sci and non-(s)sci) cited in documents mentioned above citations in professional journals, policy documents, protocols and guidelines
authorships	(co-)authorships of documents mentioned above under 'content analysis'
products	health care technologies and services instruments, programmes, methods for (assessment or implementation of) care
funding of research	(semi)governmental funding
publicity	presentations for a non-scientific audience fact sheets public media internet
memberships	member of committee issuing a policy document or a treatment guideline member of advisory committee
teaching	contributions to initial and post-initial education of health care professionals based on research output
implementation strategy	membership of advisory committees interactions between researchers and public administration feedback from target groups
independence	operationalisation of research questions research methodology analysis and publication of results

using e.g. increasingly available digital databases via internet, should be better explored for assessment purposes. The indicators of societal impact listed in Table I predominantly concern documents focussing on the situation in the Netherlands, although European and other international initiatives would seem to be increasingly relevant.

Weighing the different indicators of societal impact in relation to each other is another challenge. For publications in professional journals or policy documents there is no 'societal' counterpart of the (Social) Science Citation Index. In the overall assessment it is *the total profile* of a research project, programme or institute *in relation to its research mission* that is important (see e.g. Wameling and Spaapen⁶ and rae-report⁹).

Procedure

Following the recommendations of the knaw/nwo/vsnu working group on Quality Assurance for Research ('Quality obliged: towards a new quality assurance system for scientific research'²⁸), under the new national quality assessment system for all academic research which comes into force in 2003, research organizations will have to carry out regular self-evaluations of the quality of their research (at least twice every five years). Once every five years an external review committee will visit them to carry out a visitation on the basis of written information and interviews. If applicable, the quality questions under the new system may also refer to the socio-economic impact of research. In the case of applied health research, where the societal usefulness of the research within the foreseeable future is an explicit aspect of the mission, the Committee considers that this should be included in the assessment along with scientific quality. Performance and prospects for the future should also be assessed, and recommendations may be made. Research institutes and groups can be asked, in the context of their self-evaluation report, to list and describe the indicated 'non sci-research paper' output they consider relevant in realizing their – societal – mission. They can also be asked to present other data as to the – potential – societal impact of the research results. In order to produce a coherent evaluation and not burden the research teams unnecessarily it is important that scientific quality and societal impact be assessed together by a single external review committee. The committee's membership needs to be geared to this task.

For the evaluation of societal impact, feedback from stakeholders is important. Therefore, if warranted by the mission (or the way in which the research team interprets it), an external review committee may consult a panel of stakeholders, such as professionals, patients' organizations, health care institutions, policy-makers and research clients. They can be approached in different ways (by letter or interview,

individually or collectively) using a predetermined standard protocol. Stakeholders can have different perspectives. Therefore, stakeholders should be carefully chosen in relation to the subject and the objectives of the evaluation. Furthermore, for the purpose of efficiency the Committee advises to confine these approaches to specific questions to be asked to the stakeholders which are relevant to the assessment, evaluation and/or feedback.

Conclusions and recommendations

Conclusions

This report contains a survey for an evaluation methodology for the societal impact of applied health research. *The Committee concludes that:*

1. There is a strong need for a single, widely accepted methodology for evaluation of the societal impact of (applied) health research.
2. In the Netherlands the current methods for evaluation of the scientific quality of research are generally satisfactory. A new national system of quality assurance for all academic research will come into force in 2003.²⁸
3. Evaluation of societal impact should and can be integrated into this new evaluation system.
4. A research mission is indicative for how and to what extent societal impact of the research should be evaluated. The research mission itself should be clearly articulated, and should be reviewed in the light of both scientific and societal challenges in the field.
5. Key criteria and indicators for evaluation of societal impact and their relative weight must be detailed in advance in relation to the research mission.
6. In the overall assessment (of both scientific quality and societal impact) it is the total profile of a research project, programme or institute in relation to its research mission that is important.^{6,9}

7. External review, by one single committee, is highly regarded in the assessment of both scientific and societal impact.⁹ External review committees' membership needs to be geared to this task. The review committee should therefore also include expertise in evaluating societal impact.
8. For the evaluation of societal impact, feedback from stakeholders is important. Stakeholders to be consulted should be selected in relation to the objectives of the evaluation.
9. Special attention is needed to evaluate independence of research in order to warrant valid results and justified societal impact.
10. The results of the assessment of societal impact, together with the results of the evaluation of scientific quality, will be a basis for improvement of research quality and for further development, and can guide institutional and academic research policy.

Recommendations

As the next steps to take, the Committee recommends:

1. Universities and research institutes are requested to implement the assessment of societal impact of applied health research, according to the methods and procedures suggested in the report, in the new national quality assessment system that comes into force in 2003.
2. In order to guide this process, pilot reviews of institutes for applied health research are to be carried out in order to fully develop the methodology and its application.
3. The outcome of societal impact assessment, together with the outcome of the evaluation of scientific quality, should imply incentives for researchers in the field of applied health research. Therefore, a favourable outcome of societal impact assessment should be adopted by universities and funding organisations as an important additional criterion in deciding about research grants in the field of applied health research.
4. Available results of societal impact assessment can be reviewed on the level of both the institute or programme (*ex post* and *ex ante*) and the project. In this respect zon has already made a start by requesting that results from subsidized programmes and projects should be useful for implementation in practice.

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Invitational meeting 'The societal impact of applied health research', 19 June 2001

Programme

13.00 - 13.30 hrs.	Registration	
13.30 - 13.35 hrs.	General introduction by the Chairman of the day	Prof. Jan P. Vandenbroucke
13.35 - 13.55 hrs.	Introduction Draft Report	Prof. J. André Knottnerus
13.55 - 14.20 hrs.	Quality assured for Applied Health Research	Prof. Jan H. van Bommel
14.20 - 14.45 hrs.	Societal impact in <i>ex ante</i> evaluation of scientific research	Prof. Eduard C. Klasen
14.45 - 15.10 hrs.	Medical Journals: Do they change anything?	Prof. Richard Smith
15.10 - 15.40 hrs.	Tea / coffee break	
15.40 - 16.05 hrs.	Assessment of uk Engineering Research in Universities – some lessons learned	Prof. John E. Midwinter
16.05 - 16.30 hrs.	What role for societal impact in quality assessment of scientific research in medical faculties?	Prof. Paul J. van der Maas
16.30 - 16.40 hrs.	Summary of presented views	Prof. J. André Knottnerus
16.30 - 17.30 hrs.	Panel discussion	
17.30 - 18.30 hrs.	Drinks and refreshments	

List of speakers

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Prof. Eduard C. Klasen

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Editor British Medical Journal

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Prof. Paul J. van der Maas

Dean Erasmus Medical Centre Rotterdam; Council of Medical Faculties in the Netherlands

Summary of lectures and discussion

After the opening of the invitational meeting by *Prof. Vandenbroucke*, the meeting starts with an introduction into the draft report by *Prof. Knottnerus*, chairman of the subcommittee that prepared the report. He summarizes the most important conclusions of the draft report:

- The measurement of societal impact of research is an international issue;
- For applied health research, societal impact is not just an optional element;
- Societal impact should be evaluated in addition to scientific quality;
- Indicators can be defined in the various relevant fields;
- Assessment should and can be integrated with evaluation of scientific quality.

The subcommittee will finalise the report later this year. Furthermore, the subcommittee has the intention to perform some pilot studies, which should result in a procedure for routine assessments of the societal impact of research.

Next, Prof. Van Bommel, former Chairman knaw/nwo/vsnu Working Group Quality Assessment of Scientific Research, addresses two subjects:

First, the question is addressed if applied health research is truly different from the other medical subdisciplines. In the previous Discipline Assessment of 1998 all subdisciplines belonging to the area of applied health research were assessed separately in one cluster: Public Health Research. Evaluation of the results showed that in general, basic, and some clinical health research disciplines scored better than surgical and applied health research disciplines. Applied Health Research was evaluated comparable to that of Surgery.

It is concluded that, repeating the recommendations of the Discipline Assessment 1998, the quality of the field would be greatly enhanced if it would join forces with basic disciplines such as Epidemiology

Secondly, Prof. Van Bommel discusses if the new assessment procedure, as described in the report '*Quality Obligated*', is able to take into account aspects such as societal impact of applied health research. In summary, this new assessment procedure implies that periodically, but at least every 3 years there shall be a self-assessment and at least every 6 years, the self-assessment shall be reviewed by peers, in connection with site visits. In the draft report several possible factors are mentioned that express societal impact of research. Some of these factors can be easily implemented as part of the report on self-assessment. Therefore, it is concluded that the newly proposed procedure for research assessment offers ample possibilities to include the evaluation of the societal impact of applied health research.

Prof. Klasen, Director Netherlands Organisation for Scientific Research (nwo), addresses the fact that nwo's procedures for *ex ante* evaluation of research proposals in responsive mode open funding competition are sometimes (e.g. in areas like applied health research) too narrow, because they are judged principally on the basis of academic merit. This tends to result in lower scores to proposals relating to applied health research. He demonstrates by three examples (stw, wotro and zon) that taking societal impact into consideration in open funding competitions sometimes has an added value. However, several methodological problems are associated with *ex ante* assessment of societal impact. Firstly, there are no generally accepted objective criteria. Secondly, there is no generally accepted hierarchy of peers in relation to the societal impact of research. Finally, the result of *ex ante* evaluations by a funding agency has to be a rigid one-dimensional list of projects accepted for funding and projects rejected. This means that both academical merit and societal impact have to be combined at some point to reach a single overall decision. Although in general, the primary funding criterion should still be academic quality, the additional criterion of potential societal impact should come into play, for instance, where resource constraints mean that hard choices have to be made between otherwise very good or excellent proposals. These methodological problems

might be solved but these problems force nwo to be very careful and conscientious in selecting its evaluation procedures and cautious about participating in experiments.

Prof. Smith, Editor *British Medical Journal* starts with a couple of remarks about the draft report:

- Measuring societal impact of research is an international issue.
- Before setting up a methodology and making a final report, it would be wise to consult and to broadcast the subject to more people
- The subcommittee stated that the current methods for assessing scientific quality are satisfactory and in addition it is implicated that peer review is well established and does not have any problems. However, there have been strong criticism on both subjects in Britain.

He continues his seminar on the importance of influence for the *British Medical Journal (BMJ)*.

Influence is the first part of the mission of the *BMJ* and profit the second one. Influence is so important because it serves the needs of doctors and others to have impact upon the international debate on health issues. Influence is hard to measure and hard to define. Influence is in some way the polite word for power. There are different levels of influence:

- Something changes because of what *BMJ* has published.
- Setting the agenda or legitimising an issue.
- Leading by examples and being followed.
- Being quoted and cited.
- Being paid attention to.
- Being known about.

Based on these different levels Prof. Smith presents a scoring system that can be set up to measure influence. He concludes that it is important to try and measure the influence of journals, that achieving change is the highest level of influence and, finally, that the proposed scoring system might be the beginning of something useful.

Prof. Midwinter has experience with assessment of Engineering Research in Universities in the uk. He is the former Chairman of the Research Assessment Exercise (rae) Panel and shares his knowledge and experiences about these exercises that were held in 1992 and 1996. The final purpose of the rae is to focus available money on successful groups or departments. As in medicine, engineering has a strong

societal content. This seems to require additional measures over science, but they are often very difficult to measure. In the UK a single RAE process exists for all disciplines. It is constrained to operate in a set of well-defined forms. This procedure allowed the panel to get results back in a highly structured form and hence, it was easy to compare one department with another quickly. The procedure is reasonably fair, because everyone gets the same guidelines.

As a result of the 1996 Engineering exercise some important issues came up:

- the importance of relevance of research: is the assessed group well-plugged into society?
- the issue of exploitation: is it used, does it matter?
- the use of direct and indirect peer reviews to get more insight into a department
- the (un)reliability of the citation index for applied research
- the fact that site visits are not necessary

Based on his assessment experience Prof. Midwinter states a couple of general observations:

- You need a transparent process with clear rules.
- You have to minimise workload for the assessors and the assessed ones.
- The procedure must work for a large number and range of departments.
- Rules will inevitably shape national priorities; ergo: one must be clear about the purpose of the exercise.
- The Assessment Panel must command respect.

More information on the RAE can be found on <http://www.hefce.ac.uk>

Prof. Van der Maas, Dean Erasmus Medical Centre, Rotterdam, focusses his seminar on the role of societal impact in quality assessment of universities. Universities are needed to educate people who are able to develop new insights. To establish the first aspect, universities need independence. Society is paying for a specific type of independence of a kind, devoted to finding and disseminating the truth. That, in itself, is relevant to society, even if it does not have a short term application. The question is how to assess the quality of universities. In research, the obvious first assessment criterion is the scientific relevance. Nevertheless, the societal impact of research is also a possible aspect to evaluate for disciplines like population health, medical practice and health care system, and commercial application. Several groups would be responsible for effectuating societal impact. In the department of public health in Rotterdam researchers have the responsibility to only accept or apply for research grants, if the project/proposals ensures a real possibility of doing innovative work and is internationally publishable. In addition, the results should

also have application in public health. In order to obtain an optimal application of results, the research should have strong connections to communities, organisations, etc., who are responsible for the implementation of the results.

Prof. van der Maas is of the opinion that there would be room for evaluation of societal impact of some parts of university research. Especially if universities acknowledge that some types of research are both innovative and applicable and if researchers are allowed to apply for grants for programmes with an explicit societal application purpose.

Some aspects, however, have to be kept in mind. Societal impact itself is not a value, because detrimental societal impact is measurable as easily as a positive societal impact. The first responsibility of a researcher is to make the intrinsic scientific quality of his research visible. The societal impact should only be evaluated if it is mentioned as an explicit purpose of the research and/or institution. The deans of the medical faculties do support the notions that are laid down in the subcommittees' report. University research should, however, be judged primarily on scientific impact. Assessment of scientific quality and societal impact should be one procedure.

Prior to the panel discussion, *Prof. Knottnerus* summarises the most important conclusions of the seminars and discussions:

1. *Integration* of the assessment of societal impact in the newly designed research assessment system ('Quality Obligated') is possible and preferable.
2. It is important to characterise the *mission* of a research group as to its relevance to societal impact:
3. *Ex ante* assessment of societal impact is important, but difficult. It is very positive that zon and nwo would support an experiment in this field.
4. *One committee* should evaluate both scientific quality and societal impact.
5. Assessing scientific quality is not out of debate. The Netherlands has a good tradition in this respect. In the last two assessments differences between different fields of research were taken into account.
6. The *BMJ* experience with indicators for measurement of *influence* can be very useful and helpful.
7. *Interaction of impact and quality*: both high impact of bad research and no impact of high quality applied research should be avoided.

8. *Relevance/utility*. Stakeholders can have different perspectives. Therefore, stakeholders should be carefully chosen in relation to the subject and the objectives of the evaluation.
9. *Academic focus*. Academic research should be innovative and independent from the source of finance or sponsoring. Scientific relevance is a *sine qua non*.
10. *Responsibility of researchers*. When societal impact is part of the mission, it should be evaluated properly.
11. *The deans* of the medical faculties support the recommendations of the subcommittee.

In the panel discussion the following issues are discussed.

- *Reproducibility* of the assessment procedure:
In the last Discipline Assessment there was an enormously high correlation between different referees. However, *ex ante* evaluation of ZON research proposals with respect to implementation of the results showed a lot of discrepancy between different peers. One expects that reproducibility of *ex ante* evaluations of societal impact will be more difficult than that of *ex post* evaluations.
- The need for more *concrete criteria* of societal impact.
In this respect it was discussed that a distinction should be made between the assessment of institutions, versus individual research projects and complete programmes of activities.
- The need for *pilot studies*
In this respect three possibilities were discussed: (1) preparing an integration of scientific quality and societal impact assessment anticipating on the evaluation according to 'Quality Obligated', (2) starting a number of pilots on evaluation of societal impact, (3) make use of evaluation material that has been used in the past to evaluate programs or projects on societal impact
- The future of *scientific publishing*
It is expected that within a period of 5 to 10 years people will publish on the internet. One of the major drives will be the desire for circumvention of the publishers which make money with little benefit for the researchers and the public.

A full report of the meeting can be found on <http://www.know.nl/rmw>

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Measuring the social impact of research

Difficult but necessary

The main aim of health research is to improve the health of people. Yet the performance of researchers tends to be measured by the scientific quality of their research rather than by its impact on health. This is unsatisfactory, even nonsensical, so a committee of the Royal Netherlands Academy of Arts and Sciences is trying to devise a way of measuring the social impact of applied health research. Its first report was discussed at a recent meeting in Amsterdam,¹ and the academy now plans to experiment with methods of measuring social impact.

In an ideal world all research would be of high quality and have considerable social impact by improving health. But in the real world scientific quality and social impact do not always go together. Quality to scientists tends to mean originality of subject, thought, and method. Much research that scientists judge of high quality has no measurable impact on health—often because the lag between the research and any impact may be decades. Thus scientists would think of the original work on apoptosis (programmed cell death) as high quality, but 30 years after it was discovered there has been no measurable impact on health. In contrast, research that is unlikely to be judged as high quality by scientists—say, on the cost effectiveness of different incontinence pads—may have immediate and important social benefits.

The bodies that fund research with public money want both high quality research and social benefit, but current systems for measuring the performance of researchers concentrate on quality. The result might be a serious imbalance in the research portfolio. The Dutch committee concluded that “current methods for evaluation of scientific quality are satisfactory.” In the Netherlands they are based on an assessment made by an international committee of peers using self-evaluation by the group being assessed; publications in journals;theses; patents; and plans for the future. Though the Dutch might be satisfied with their methods, there have been strong criticisms of the British research assessment exercise,² and internationally there are doubts about the widespread use of the impact factor of journals for measuring the quality of research.³ Moreover, peer review, a central component of most scientific assessments, has been criticised as slow, expensive, ineffective, biased, prone to abuse, anti-innovatory, and something of a lottery.⁴

Nevertheless, systems do exist for measuring the scientific quality of research—and are widely used. The Dutch committee concluded that a new instrument was needed for measuring social impact, and that it should be integrated with instruments for measuring scientific quality.

In order to succeed, the Dutch committee said that the instrument should (a) fit with current ways of evaluating research, (b) look to the future also, (c) be efficient for both assessors and the assessed, and (d) work in practice. The committee found that it couldn't produce a “fully worked out methodology,” but it did list indicators that might be used (see box) and advised

Indicators that might be used to assess the social impact of research

Content analysis
Professional publications
Treatment guidelines and protocols
Policy documents
Cochrane library
Textbooks
Teaching materials
Lay publications
Symposia
Citation analysis
Scientific publications cited in documents listed above
Podcasts
Healthcare technologies and services
Instruments, programmes, methods for assessment or implementation of care
Funding of research
(Semi)governmental funding
Patents
Presentations for a non-scientific audience
Fact sheets
Public media
Interviews
Memberships
Member of a committee issuing a policy document or a treatment guideline
Member of advisory committee
Teaching
Contributions to education of health professionals based on research

that criteria to be used for specific assessments should be listed in advance. A message that came through strongly at the Amsterdam meeting—particularly from John Midwinter, a British professor of electrical engineering with long experience of research assessment—was that assessment would work only if the rules were clear. Failing to compare like with like may mean that the assessment will not be fair.

The Dutch are now beginning pilots to produce a fully worked out method, but others might also want to experiment with new methods for assessing the social impact of research. There is clearly a need for such a method; otherwise, those who do research with important social benefits may lose out in the increasingly competitive battle for research funds. The ultimate losers would be patients and communities.

Richard Smith, *editor, BMJ*

RS was an unpaid consultant to the Dutch committee and gave a talk at the Amsterdam meeting (for which he was paid expenses) on how the influence of a medical journal might be measured.

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