

Review

The value and impact of information provided through library services for patient care: a systematic review

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Abstract

Objective: An updated systematic review was carried out of research studies looking at the value and impact of library services on health outcomes for patients and time saved by health professionals.

Methods: A comprehensive systematic search was undertaken of the published literature to September 2003 in ERIC, LISA, MEDLINE, PREMEDLINE, EMBASE, the Cochrane Controlled Trials Register and Google. Some handsearching was carried out, reference lists were scanned and experts in the field were contacted. Twenty-eight research studies of professionally led libraries for health-care staff, including clinical librarian projects, met the inclusion criterion of at least one health or 'time saved' outcome. Papers were critically appraised using internationally accepted criteria. Data were extracted and results were summarised using a narrative format as the studies were heterogeneous and precluded a statistical analysis.

Results: There is evidence of impact from both traditional and clinical librarian services. The higher quality studies of traditional services measured impacts of 37–97% on general patient care, 10–31% on diagnosis, 20–51% on choice of tests, 27–45% on choice of therapy and 10–19% on reduced length of stay. Four studies of clinical librarian projects suggested that professionals saved time as a result of clinical librarian input, and two of these studies showed evidence of cost-effectiveness. However, the clinical librarian studies were generally smaller, with poorer quality standards.

Conclusions: Research studies suggest that professionally led library services have an impact on health outcomes for patients and may lead to time savings for health-care professionals. The available studies vary greatly in quality but the better quality studies also suggest positive impacts. Good practice can be gathered from these studies to guide the development of a pragmatic survey for library services that includes the direct effects for patients among the outcome measures.

Introduction

Within the health service, one of the key measures of the benefits accruing from a library service is the

impact it has on improving patient care. Identifying the means to demonstrate this benefit to users, managers and funding bodies has long been recognised as a challenge, and there is ongoing debate as to whether such benefits can be reliably measured.

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It is notable that the Medical Library Association has steered away from attempts to measure the direct impact of library services on health outcomes.¹ Their Standards for Hospital Libraries include such measures as 'frequent provision of information on which patient-care decisions are based' and 'active membership of the librarian on performance improvement and patient safety teams'. Abels and colleagues² used a comprehensive systematic review to develop a taxonomy (i.e. measures and their surrogates) to assess the value of library and information services to hospitals and academic health institutions. Pre-test interviewees noted that there are significant intervening variables for direct outcomes such as 'reducing length of hospital stay' and 'avoiding unnecessary tests' and suggested that there was no valid way of measuring the contribution from the library and information service. The outcome of such decisions meant that proposals for the measurement of the organizational goal of providing excellent clinical care were indirect measures such as 'support informed and timely decision making' and 'support the development of policies and procedures relating to clinical care'.

Despite the difficulties of measurement, however, there is an expanding body of evidence from existing systematic reviews that information provided by a library service can influence patient-care outcomes in various ways and assessment of impact at a local level is feasible³⁻⁶ even if reliant, as is often the case, on indirect measures. In addition, there is evidence that library services can lead to time savings for health-care professionals and, thus, to cost savings and health-care benefits.⁴⁻⁶ In the most recent systematic review of clinical librarian studies⁶ published during the data-gathering stage of this review, the authors concluded that (using weighted averages from 12 studies) 65% of respondents felt that services contributed to better patient care. However, it was also noted that evidence of impact on the outcomes of patient care, cost-effectiveness and qualitative data were limited, and that more high-quality research evidence was required.

Measuring a direct impact on patient care is therefore difficult, but tangible evidence of benefit is needed to justify continued expansion and investment in health-care libraries and patient-care outcomes should logically be included, along

with the social and educational benefits of the library service.

Given the large amount of recent research in this area, the Quality and Statistics Group of the Library and Knowledge Development Network (LKDN) in the UK undertook to carry out an updated systematic review of the literature. The research objective was to review studies looking at the value and impact of library services on health outcomes for patients and time saved by health professionals. Information provided within traditional library settings, including searches carried out by librarians for users (mediated searches), and clinical librarian programmes, are considered in this review as these services represent a continuum of provision and are not clearly distinct. It was decided to report on research studies looking at clinical librarian projects as a separate subgroup, to investigate if any general differences in the type(s) of service provision and outcomes emerge, with indications for good practice.

An additional aim of this review was to provide information on best practice to assist the LKDN Quality Panel in developing a pragmatic user survey tool that librarians might use to obtain a measure of the value and impact of the service in terms of patient care and time saved by health professionals. A paper describing this developmental work is in preparation.

Methods

Search strategy

Searches were carried out in January to March 2003 with update searches in September 2003 on the following databases: ERIC, LISA, MEDLINE, PREMEDLINE, EMBASE, Cochrane Controlled Trials Register, Google.

The search terms used were:

[[Performance indicator* OR performance measure* OR performance standard* OR impact OR value] and [Health* librar* OR medical librar* OR postgraduate centre librar* OR hospital librar* OR nursing librar* OR (health* close to information service*) OR (medical close to information service*) OR virtual librar* OR electronic librar* OR electronic information]]

OR

[(clinical or medical or support or outreach) librarian* OR clinical information (professional* or specialist*) OR informationist* OR informaticist*]

In addition, handsearching of the *Health Information Libraries Journal* and *Journal of the Medical Library Association* for all issues in 2003 was carried out in September 2003.

An e-mail was sent to the JISC-mail discussion lists lis-rlg and lis-medical in March 2003 requesting information on papers describing surveys or other methods to obtain a measure of the impact, or value, of library services in terms of health benefits for patients and members of the public. A summary of the project was published in the *CILIP Health Libraries Group Newsletter* in September 2003 asking for contributions. Specific requests were also made to centres involved with clinical librarian programmes.

Inclusion/exclusion criteria

Research papers and reviews of papers examining the impact of services provided from professionally led libraries for health-care professionals, including clinical librarian projects, were sought. Studies had to have at least one outcome measure relating to health benefits for patients and/or members of the public, or to time saved by health professionals. Impact studies of 'virtual' (electronic) libraries were excluded unless these included traditional (librarian-run or mediated) services. The specific impact of information skills training provided within, or outside, the traditional library service was excluded. This topic is covered by a recent systematic review based on a literature search to September 2002.⁷ Specialist information services delivered to particular professional groups (e.g. primary care) outside the traditional library setting⁸ were also excluded.

Although the impact of library services³ and clinical librarian projects⁵ has been studied by recent systematic reviews, and these have provided a large number of relevant studies, it was felt that a sufficient number of additional research studies had been published since the literature search dates of these reviews to merit an update. When

the Wagner review was published⁶ during the preparation of this review (literature review to 2001), the reference list was scanned but no further clinical librarian studies with patient outcomes were located.

Critical appraisal

All types of research study were included. All papers that were potentially relevant according to information in the title and/or abstract were obtained in full. Relevant papers were then critically appraised using established methods^{9–13} and summarised. The critical appraisal sheets and data extraction forms used can be obtained from the authors. Additional publications located from reference lists, including those of existing reviews^{3–6} were examined individually and appraised if they met the inclusion criteria for this review. Each paper was appraised in detail by one author and overseen by the other, with any concerns being resolved by discussion. A flow chart describing this process is given in Fig. 1.

During critical appraisal, in addition to collecting information on study type, total numbers and response rate, a crude measure of quality based on five additional criteria was established for each study. The criteria, which are based on established good practice for survey design^{10,12,13} were:

- 1 A 100% or truly random sample was used to ensure that a representative sample of the user group were surveyed.
- 2 The sample was **not** pre-selected. (Where subjects are given the opportunity to refuse to participate at outset, as in the Rochester study, volunteers are more likely to be those that value the library service—leading to the potential for a non-representative sample as a result of 'desirability bias'.)
- 3 The responses were anonymous, and the subjects were aware of this, to encourage honesty.
- 4 The researcher(s) were independent of the library service under study to ensure an objective view of the data and anonymity of respondents.
- 5 The survey asked about a specific incidence of library use at, or soon after, the provision of the information (current), or users were asked to request information for a patient-care query and

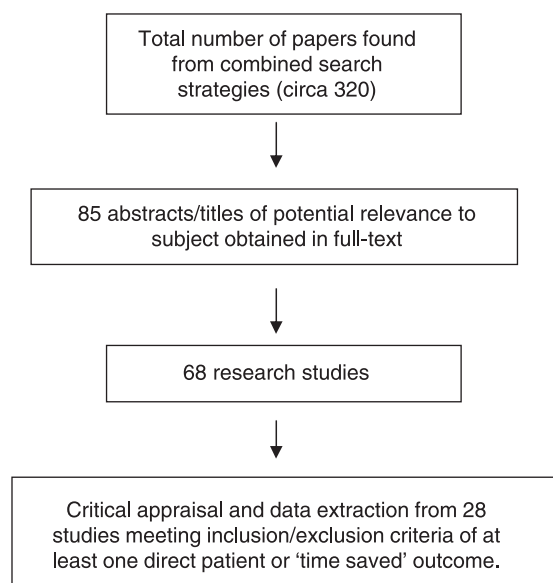


Figure 1 Selection of studies for inclusion in the systematic review.

to assess its value (prospective). In these circumstances, bias from 'recall' errors made as a result of the lapse of time (for example, the more likely recall of an influential piece of information) is potentially reduced.

If there was no clear answer to a particular query in the publication, the quality measure was considered unmet.

Data analysis

Data were extracted from each study to provide information on the research question, the study population, the study design, the main results and any comments on the potential sources of bias (confounders). The following specific information was provided on study design:

- 1 The method(s) of data collection—questionnaire, interview and/or other techniques.
- 2 Whether questions were asked about library use in general or a specific incidence of library use. This latter method is sometimes called the critical incident technique.
- 3 Whether users were asked to consider information they had used in the past (retrospective), had received during the past 7 days (current) or a request was made to respond to the survey following a future use of information (prospective). Although a meta-analysis is theoretically possi-

ble, the research studies varied greatly in research design, setting, user group(s) and the way the questions were asked. Thus, a formal statistical analysis was not considered appropriate. The results are presented as a narrative summary with ranges of responses where possible.

Results

Data from the included studies are given in Tables 1 and 2.

Only those studies meeting a response rate of 20% or more and at least two of the quality criteria (see Methods) were included within the results tables. One traditional and two clinical librarian studies were, thus, excluded at this stage.^{15,39,40} An additional pilot study looking at a traditional library (inter-library loan) service was also excluded as only two respondents assessed the influence of the information provided on patient care.¹⁸ It must be stressed that these quality measures are a crude assessment of quality. In addition, although it would have been ideal, authors of individual studies were not contacted to confirm or refute the quality criteria assessments. Details of included studies and measured outcomes are given in Tables 3 and 4. The study by Klein²² is considered separately and is not included in the results tables as this piece of research was an economic analysis as well as the only controlled study reporting patient outcomes (Table 1).

The results suggest clear evidence of an impact of library services on patient outcomes from both traditional and clinical librarian services. This is also the case in the higher quality studies (Tables 4 and 5). It is possible that there was a trend for these higher-quality studies to report reduced impacts but, because of the limited number of data points, a statistical analysis lacked the necessary power to determine this. The higher quality traditional library studies (where four or more of the additional quality criteria were met) suggest effects of impacts of between 37 and 97% on general patient care, 10–31% on diagnosis, 20–51% on choice of tests, 27–45% on choice of therapy and 10–19% on reduced length of stay (Table 4).

The economic analysis by Klein²² concluded that, when compared with control cases, test cases associated with earlier literature searches had

Table 1 Traditional library services

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
Ali, 2000 ¹⁴	How information provided by medical libraries can enhance day-to-day management of patients.	Total population of medical specialists and registrars in two Canberra hospitals. • Questionnaire • Specific use • Prospective	Response rate 28% (80/288). Information provided did, or would contribute to better quality of care 82%; Would definitely handle some aspects of clinical situation differently 23%; Would probably handle some aspect of the clinical situation differently 52%; Identified important changes to care as a result 54%. <i>Used for/changes made:</i> Choice of management 57%; Advice to patients 47%; Prescribed medication 27%; Choice of lab tests 20%; Choice of other tests 24%; Diagnosis 10%; Reduced length of hospitalization 10%. <i>Avoidance of:</i> Tests and investigation 23%, Surgical intervention 19%, Additional outpatient visits 12%, Hospitalization 11%, Risk of hospital acquired infection 8%.	Respondents were asked to remain anonymous although survey may have been closely associated with library staff resulting in desirability bias.
Ashcroft, 1998 ¹⁵ (excluded from further analysis)	To find out what value physiotherapists place on the information obtained through their hospital library service and whether the information had an impact on patient care.	Physiotherapists in 37 NHS Trust hospitals in the Northern and Yorkshire region of England. • Questionnaire • Specific use • Prospective	Response rate 5% (73/1460). <i>Used for/changes made:</i> Choice of treatment 53%; Amount of treatment received 35%; Criteria for treatment 39%; Advice given 59%. <i>Avoidance of:</i> Greater inpatient treatment 16%; Additional outpatient hours 24%; Ineffective/inappropriate treatment 55%; Inappropriate referral 29%.	The response rate was too small to generalize from these results and this study was excluded from further analysis. Excellent attempts were employed to reduce 'desirability bias', the questionnaire was piloted and is a potentially strong model for a further study.
Burton, 1995 ¹⁶	Do libraries in regional hospitals in New Zealand influence patient care?	All physicians in the six regional (200–450-bed) hospitals that agreed to participate. Rochester-style survey but retrospective.	Response rate 81% (295/372) (usable responses 80%). <i>Used for/changes made:</i> Diagnosis 93%;	Good response rate. Survey was closely linked to library staff and may have lead to desirability bias.

Table 1 Continued

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
		• Questionnaire • General use • Retrospective	Advice to patients 54%; Laboratory tests 35%; Radiography requests 19%; Drug regimens 40%; Reduced length of stay 20%. <i>Avoidance of:</i> Additional procedures/tests 30%; Admission to hospital 10%; Transfer to another hospital 12%. Response rate 20% (799/3877). <i>Used for/changes made:</i> Interpretation of signs and symptoms 27%; Differential diagnosis 58%; Treatment 61%; Drug regimens 26%. <i>Avoidance of:</i> Hospital admission 17%; Hospital acquired infection 25%; Additional tests 28%; Surgery 34%; Follow-up outpatient visits 40%; Loss of physicians time (i.e. time saved) 49%.	Responses probably anonymous but unclear. Published as conference proceeding only so limited information and no peer review. Confounding not discussed by authors. Low response rate but very large study. Closely associated with library and may have resulted in 'desirability bias'. Respondents probably anonymous.
Casado Uriguen <i>et al.</i> , 1994 ¹⁷	What is the importance of library services in Spanish University Hospitals within the global context of the hospital and, in particular, the day-to-day work of physicians?	All doctors at five hospitals. Rochester-style survey. • Questionnaire • General use • (probably) Retrospective	Response rate N/A. No requests were directly related to current patient-care queries although two interviewees changed their clinical behaviour—one claiming that changes put into practice helped to reduce waiting list from 2 years to 6 months. Response rate 40% (311/776).	Very small, single-site, pilot study. Self reported. Requests essentially for academic assignments. Only two interviewees commented on patient outcomes—thus excluded from further analysis.
Chamberlain, 2003 ¹⁸ (excluded from further analysis)	Why do mental health professionals request inter-library loans and to what use(s) do they put the articles received?	10 interviewees (three staff nurses, three psychologists, two student nurses, one SHO, one practice educator) from a psychiatric unit in a UK primary care trust. • Interview • Specific use • Current	Improved quality of life for patient/carers 68%; Influenced initial assessment of patient/client 45%.	Random sample, independent evaluation. Based on Urquhart (1995)—the IMPACT study.
Davies <i>et al.</i> , 1997 ¹⁹	What is the impact of information on the clinical knowledge and practice of nurses, midwives and health visitors?	A random sample of nurses, midwives and health visitors using UK health libraries. Two surveys. The second (impact) survey was attached to information provided by the library (inter-library loans and literature searches). • Questionnaire • Specific use • Current		

Table 1 Continued

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
Johnson, 1995 ²⁰	Did mental health practitioners decide to make changes in patient care as a result of information obtained from library literature searches?	Multi-disciplinary mental health professionals (psychiatrists, psychologists, nurses, pharmacists, etc.) served by the Missouri Institute of Mental Health—37% in hospital and remainder in other settings. All professionals who requested searches were included. • Questionnaire • Specific use • Retrospective	Response rate 59% (200/340). <i>Used for/changes made:</i> Diagnosis 14%; Tests 13%; Choice of medication 13%; Choice of treatment 38%. Wide variations between professional groups (details in paper).	Closely associated with library with questionnaires returned to Library Director—unclear whether respondents could be identified from the questionnaire.
King, 1987 ²¹	What is the ability of the library to meet health professional needs and the impact of the information on the quality of patient care?	Physicians, nurses and other health professionals from eight hospitals in the Chicago area requesting information relating to a current case or clinical situation. • Questionnaire • Specific use • Prospective	Response rate: 57% (184/310). Information from the library contributed to higher-quality care 94%; Definitely handled some aspect(s) of the case differently 22%; Probably handled some aspect(s) of the case differently 52%.	Attempts to limit bias: e.g. Librarians did not participate in the assessment process and were not able to identify the health professionals involved. No record was kept of those who declined to be involved and participants more likely to be supporters of the library.
Klein <i>et al.</i> , 1994 ²² (excluded from further analysis)	To examine the associations between the economic indicators of hospital costs, charges and length of stay for inpatient cases and the use of MEDLINE searches for such cases.	Physician requested MEDLINE searches mediated by a professional librarian in three metropolitan hospitals in Detroit. • Case comparison • Specific use • Prospective and controlled. 192 test cases compared with 10 409 control cases where no identified MEDLINE search was carried out. Only 34 grouped pairs were analysed.	Response rate N/A. When compared with matched control cases, test cases where searches were carried out earlier had lower costs, charges and lengths of stay than those whose searches were carried out later. For those cases where earlier searches (conducted during first half of hospitalization) were carried out, the following reductions were noted: Costs (to hospital) 70%; Charges (to patient) 68%; Length of hospital stay 65%.	Excellent attempt at objective assessment. Test cases were more severe than controls (but adjusted in the statistical analysis). The physician characteristics were not examined. A request for a search could have been associated with all-round excellent patient care and, thus, one of many factors that could influence outcomes. Not directly comparable with other studies so considered separately.

Table 1 Continued

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
Lovas <i>et al.</i> , 1991 ²³	To examine the purposes for which health professionals requested inter-library loans, how the immediacy of need for items affected their usefulness, the effect on the health professional's work and whether the illustrations were an important part of the content of documents.	A stratified random sample of requests in Region Seven of the Inter-Library Loan Network: Arizona, California, Hawaii, Nevada, Pacific basin. 53% of ILLs were requested by physicians. • Questionnaire • Specific use • Current	Response rate 82% (1412/1722). Documents were requested to support clinical care 51%; Percentage of documents requested for clinical care that were read 95%; Loan documents deemed to have had a major effect on the health professional's work 47%.	Participating libraries and health professionals were randomly selected. The survey was probably associated with the participating library and there may have been desirability bias. Patient care outcomes non-specific.
Marshall, 1992 ²⁴	To determine the relevance of library services to patient care.	A systematically sampled set of physicians in 15 hospitals in the Rochester area (seven in the city and eight in the surrounding rural area) asked to request information relating to a current clinical case. • Questionnaire • Specific use • Prospective	Response rate 46% (208/448). 97% of the physicians said that information provided by their hospital librarians contributed to better-informed clinical decisions. <i>Used for/changes made:</i> Diagnosis 29%; Choice of tests 51%; Choice of drugs 45%; Reduced length of stay 19%; Advice given 72%. <i>Avoidance of:</i> Hospital admission 12%; Patient mortality 19%; Hospital-acquired infection 8%; Surgery 21%; Additional tests or procedures 49%; Additional outpatient visits 26%. Response rate 66% (51/77). 89% of searches contributed to clinical decision making.	Systematic sampling with a random start from each hospital's lists but refusals to participate were not counted and desirability bias can't be avoided. Built on lessons learnt from Chicago study. Questionnaire was pre-tested. Many attempts to reduce bias—Research assistant carried out the study, the librarians did not know who was selected and the physicians were asked not to reveal their involvement.
Quality Development Team, 2003 ²⁵	To analyse the effectiveness of the literature search service in terms of contribution to patient care and the professional and/or academic	Questionnaire survey, following receipt of the results, of all users (from South Staffordshire NHS Trust and local Primary Care Trusts) requesting a literature search during a 3-month period.		The survey was likely to be closely associated with library staff although the questionnaires were analysed by the Quality Group and the letter accompanying the questionnaire

Table 1 Continued

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
	development of the user.	• Questionnaire • Specific use • Current		stressed that responses were confidential. Small sample size but good response rate. No specific patient outcomes.
Scolaro, 1995 ²⁶	To examine the impact of inter-library loans (ILLs) and literature searches provided by the library.	All requests for inter-library loans/ literature searches at a hospital in Australia during a 6-month period. Users were from medical, nursing, allied health, administration and research professions. • Questionnaire • Specific use • Current	Response rate 37%. (278/745) for ILLs and 36% (82/226) for literature searches. On a scale of 1 to 4 (1 = low, 4 = high) 62% literature searches and 37% ILLs were graded 3 for impact on patient care (59% of literature searches and 34% ILLs had been requested specifically for patient care).	Published as conference proceeding. Low response rate but all requestors received a questionnaire. Carried out by library staff so desirability bias is a likely confounder but responses were anonymous. Single centre only. Patient outcome question is broad.
Webster Fisher & Reel, 1992 ²⁷	To establish total quality management benchmarks and to examine the significance of the role of the library in clinical care.	The entire clinical staff of Norton Hospital and Kosair Children's Hospital, Kentucky. 56% nursing, 23% allied professions, 21% clinicians. • Questionnaire • General use • Retrospective	Response rate 26% (543 usable/2101). 50% physicians reported that library information had an affect on diagnosis, choice of drugs or other therapy. 48% physicians reported an affect on diagnostic tests. 88% physicians, 58% allied health professionals and 69% nurses reported that information contributed to higher-quality care.	The research was associated with the library committee and desirability bias cannot be excluded. However, the Planning and Marketing Department received and reviewed completed surveys to ensure anonymity. A copy of the questionnaire is available from the authors on request.
Urquhart & Hepworth, 1995 ²⁸	To examine the value to clinical decision making of information provided by NHS library and information services. To examine the factors affecting the delivery of that information to clinicians (the IMPACT study).	Clinicians at 11 hospital sites (over 600 clinicians and 43 health information library services provided data). • Questionnaire, interview and analysis of search requests • Specific use • Current	Response rate: Critical incident survey 46% (519/1133); Library searches and requests 68% (486/713); Dial up MEDLINE 60% (60/100). From the critical incident analyses, patient-care purposes were involved in 66% of incidents when clinicians sought information, but in only 37% of these was patient care the sole purpose.	Informed by Rochester and NLM studies. A variety of methods to gain information were used. Random samples of subjects were selected for the critical incident survey and dial up. The direct participation of site staff was precluded.

Table 1 Continued

Paper	Question	Study population and research design	Main results Effects of the information provided as percentage of 'yes' responses with multiple responses allowed	Comments/ confounders
Wilson <i>et al.</i> , 1989 ²⁹ also published as Lindberg <i>et al.</i> , 1993 ³⁰	To understand ways in which computer-mediated searching of MEDLINE affects patient care and other professional activities.	1158 critical incident reports derived from 545 interviews with a purposive sample of professionals, mostly physicians. 65% were direct users of MEDLINE throughout the USA and 35% had MEDLINE searches undertaken for them. • Questionnaire and interview • Specific use • Retrospective	From the library group <i>Used for/changes made:</i> One or more categories of clinical decision making 79%; Recognition of abnormal or normal condition 36%; Identification/evaluation of alternative therapies 35%; Improved quality of life for patient or family 33%; Confirmation of proposed therapy 32%; Differential diagnosis 31%; Minimisation of risks of treatment 27%; Audit or standards of care 26%; Revision of treatment plan 25%; Choice of diagnostic test 22%. Response rate: 48% of total known eligible interviewees (545/1135). 476 searches affecting patient-care decisions identified. <i>Use of information (included multiple responses):</i> diagnosis & etiology 41%, treatment and prognosis 51%, maintaining effective physician-patient relationship 4%, disease prevention 3%, discharging responsibilities to third party payers 1%. <i>Patient care outcomes.</i> With a positive effect on: Longevity 5%, Abnormalities—23%, Symptoms—3%, Function—1%. Improved diagnosis 16%, Improved treatment—25%, Improved referral—11.5%, Received care when otherwise may not have done—0.3%, <i>Process outcomes</i>—66.5%, of which: Unnecessary tests/procedures avoided—13%, Risks avoided/reduced 7%, Hospitalization reduced—1.6%, Cost of care minimised or reduced—1.3%, Insurance benefits—4%.	Huge cross US sample and attempts to reduce bias. Random sample, independent of libraries and anonymous. However, participants were asked to recall noteworthy rather than typical search.

Table 2 Clinical librarian studies

Paper	Question	Study population and research design	Main results	Comments/confounders
Barbour & Young, 1986 ³¹	An evaluation of the effect of the clinical librarian programme to the morning report.	Residents and interns of a general medical and surgical hospital in the USA. • Questionnaire • General use • Retrospective	Response rate 76% response (actual numbers not given). Literature of value in diagnosis or treatment, 95%; Saved time 86%.	Very little information provided about the research methods used. The sample size is not given and the study may have been closely associated with the librarian leading to desirability bias.
Booth <i>et al.</i> , 2002 ³²	Evaluating impact on patient care, e.g. changes in practice/treatment/therapy as a result of information provided by clinical librarians.	Evaluation of two clinical librarian posts in a UK University Hospitals NHS Trust. 10% of baseline population in Directorates targeted by the clinical librarian service were assessed. • Questionnaire and interview • Specific use • Retrospective by questionnaire, based on the Value tool-kit using the critical incident technique, plus specific interviews with volunteers.	Response rate 58% (42/72). 27.8% of information from the literature was identified as having an impact on patient management. Information provided assisted either significantly or moderately: In diagnosis 62%; In choice of intervention 85%; Length of stay 29%; Information given to patients 74%; Future clinical decisions 94%; Better understanding of patients condition 94%. A cost saving (consultant vs. librarian carrying out search) of £26 per hour spent searching was estimated. However, the service was seen more as providing literature searching services than answering clinical queries.	The study aimed to reduce bias. The evaluation was carried out by an independent research assistant and a random stratified sample of subjects were assessed. Confidentiality was assured to respondents.
Freeth, 2002 ³³	Evaluation of the impact of the work of the Clinical Support Librarian (CSL) on clinical practice. Evaluation of impact of the first post holder.	Users of CSL service in a multi-disciplinary hospital library. • Questionnaire, interview and field notes • General use • Retrospective	Response rate 35% (38/110) plus 26 semi-structured interviews with volunteers. Reports identifiable cost savings—switches to cheaper drugs and materials; reduced length of stay; reduction in re-admissions. Actual cost savings not verified. Above said to result, at least in part, from CSL input	The Evaluator was independent of the CSL but the interviewees were self selected, and recommended by the CSL. Risk of 'desirability bias'. Participants were assured that their responses would be confidential and anonymous, however.

Table 2 Continued

Paper	Question	Study population and research design	Main results	Comments/confounders
Freeth & Smith, 2003 ³⁴	Evaluation of the impact of first post holder to the Clinical Effectiveness Librarian (CEL) Service.	Users of CEL service in a London NHS Trust. • Questionnaire plus telephone and face-to-face interviews • General use • Retrospective	Development of protocols, guidelines, etc.—although difficulties in implementation may reduce impact. Health-care professionals' time saved. Response rate 33% (49/155 questionnaires returned); plus seven telephone or face-to-face interviews. Staff recognised potential impact of CEL role on patient care, but identified a number of barriers to putting findings into practice. Several respondents noted that the CEL saved them time and that CEL could search more quickly.	The Evaluator was independent of the CEL but the interviewees were self selected, and recommended by the CEL. Risk of 'desirability bias'. Participants were assured that their responses would be confidential and anonymous, however.
Giuse <i>et al.</i> , 1998 ³⁵	To determine the extent to which clinicians trust the librarians' ability to evaluate, interpret and synthesize the medical literature.	38 clinical staff—30 physicians, 2 nurses and 6 pharmacists—in a US medical library. • Questionnaire • General use • Retrospective	Response rate 100% ($n = 38$). Using a Likert scale where 1 = low and 10 = high marks were: 9.4—accuracy of librarians interpretation of literature 7.8—avoided some referrals 8.9—improved patient care.	A small sample size but good attempts to reduce bias; the questionnaire was carried out by an independent research assistant and results were blinded.
Royal <i>et al.</i> , 1993 ³⁶	Whether information provided by the clinical librarian changed interpretation of the pathology in some cases.	Medical students and pathology residents in a US University medical library. All residents and faculty who had participated were surveyed after 6 months of the clinical librarian programme and a random sample of those requesting individual searches. • Questionnaire • Mixture of general and specific • Current (in terms of literature searches)	Response rate 60% (31/51). Respondents were asked to assess whether the information had changed their interpretation of the pathology in some cases using a Likert scale (1 = high, 5 = low): 1 = 45% 2 = 29% 3 = 19% 4 = 6%	The exact nature of the study is unclear and sources of bias may exist.
Schall & Wilson, 1976 ³⁷	Whether the literature provided by the clinical librarian during ward rounds was of any value	All staff present on rounds in the Neonatal Intensive Care Unit (NICU) and	Response rate 83% (30/36) from NICU, 58% (15/26) from Orthopaedics.	Potential for desirability bias since the survey may have been closely associated with the

Table 2 Continued

Paper	Question	Study population and research design	Main results	Comments/confounders
	in determining the diagnosis or treatment of patients?	Department of Orthopaedics during 8 months of project. • Questionnaire • General use • Retrospective	Programme was of clinical importance in determining the diagnosis and treatment of patents hospitalized (97% NICU, 67% Orthopaedics). In NICU, 60% of respondents said information was of use for 1–5 patients, whilst in Orthopaedics this only applied in 40% of cases.	service as an independent evaluation was not carried out. All users and potential users of the service were surveyed. Limited information provided as to how the study was carried out.
Scura & Davidoff, 1981 ³⁸	Whether information provided through the clinical librarian service affected patient management and, if yes, how was management influenced?	House Officers on medical and paediatric services in a US university hospital. Random sample of 50 searches from a total of 287 searches over 5 months. • Interview (probably) • Specific use • Current	Response rate 96% (48/50). Patient management was affected in 20% of cases. Influenced either diagnosis or therapy. The cost of the service per question was estimated at considerably less than the cost of a chest X-ray.	The sample of interviewees was randomly selected. Response rate high. The survey was carried out by the clinical librarian and this may have led to 'desirability bias'.
Tobia & Kronick, 1983 ³⁹ (excluded from further analysis)	Can a clinical information consultancy service replace or supplement a clinical librarian service	House staff in the Department, of Medicine, University of Texas Health Science Center • Questionnaire • General use • Retrospective	Response rate 29% (37/126). 100% said saved time (2.2 h on average).	Continuation of service would be influenced by outcomes of study. Only one quality criterion confirmed (currency) and thus excluded from further analysis.
Ward <i>et al.</i> , 2001 ⁴⁰ (excluded from further analysis)	To test the feasibility of an outreach clinical librarian service in an acute hospital setting.	Evaluation of a 6-month pilot programme working with two clinical teams in a general hospital. All members of the teams were surveyed regarding the detailed evaluation of the service and individual questionnaires were also attached to each summary sent by the CL.	Response rate to individual questionnaires 10% (14/136). In another questionnaire asking for a detailed evaluation of the Service there were only 15 responses but 73% (8/11) of those who responded to the question indicated that the information provided had a direct impact on patient care.	Low response rate to individual questionnaire and response rate to more detailed questionnaire unknown. The group may have been self selected (desirability bias) and the evaluation may have been closely associated with the clinical librarian. Only one quality criterion confirmed (100% sample) and thus excluded from further analysis.

Table 2 Continued

Paper	Question	Study population and research design	Main results	Comments/confounders
Veenstra, 1992 ⁴¹	Whether end-user searching has lessened the need for clinical information specialists.	• Questionnaire • General use • Retrospective 1st year interns, junior and senior residents and transitional 1st year interns (33 in total) at a US hospital. • Questionnaire • General use • Retrospective	Response rate 91% (30/33). Of 45 physicians selected, 12 were unavailable. 93% respondents said that information provided by clinical librarian impacted on patient care in 40–59% of time. The clinical librarian found information that respondents had failed to find themselves.	Risk of response bias—some events had occurred up to 11 months earlier. Single-site study—small number of respondents ($n = 33$). The responses were anonymous but study may have been closely associated with the clinical librarian leading to 'desirability bias'.
Veenstra & Gluck, 1992 ⁴²	Did a clinical librarian in the intensive care setting may provide information that assists House Officers with diagnosis and therapy in a cost-effective manner.	House Officers in medical-coronary ICUs over a 3-month period. 66 patient-related questions were asked. • Questionnaire • Specific use • Current	Response rate 65% (43/66). 37.2% information aided in diagnosis, of which: • 3—cancelled unnecessary tests • 11—helped with interpretation of tests • 1—required further tests 51.2% aided therapy 30.2% led to better patient management. The cost of finding the information on a question was approximately the same as the cost of a chest radiograph in 1999 (\$45, excluding any Fax: costs, vs. \$50).	Single-site study and a small sample size. All who asked questions were surveyed. Questionnaire was attached to the information provided by clinical librarian so risk of 'desirability' bias. However, an established service, no threat of withdrawal if poor results obtained.

lower costs, charges and lengths of stay than those whose searches were carried out later (Table 1).

From the clinical librarian studies, there are indications of direct patient benefits and, notably, of time saving for health-care professionals and cost benefits (Table 5).

Discussion

This review provides updated evidence that health-care libraries can influence patient outcomes in

various ways. Evidence of impact is available both for traditional library services as well as for clinical librarian studies. There is also evidence, notably from the clinical librarian studies, of time savings to health-care professionals and cost-benefits. Of two studies attempting to measure the costs of the clinical librarian service, one found that the cost per question was approximately equivalent to that of a chest radiograph.⁴² Another estimated a cost saving of a clinical librarian versus a consultant search of £26 per hour in 2002.³²

Table 3 Quality measures of included studies
(a) Traditional library

	Urquhart & Hepworth, 1995 ²⁸	Davies <i>et al.</i> , 1997 ¹⁹	Lovas <i>et al.</i> , 1991 ²³	Quality Develop. Team, 2003 ²⁵	King, 1987 ²¹	Wilson <i>et al.</i> , 1989 ²⁹	Marshall, 1992 ²⁴	Scolaro, 1995 ²⁶	Ali, 2000 ¹⁴	Webster Fischer & Reel, 1992 ²⁷	Burton, 1995 ¹⁶	Johnson, 1995 ²⁰	Casado Urigen <i>et al.</i> , 1994 ¹⁷
Sample size	1133 CIT 713 Lit sear 100 MEDLINE	776	1722	77	310	1135	448	745 ILL 226 Lit	288	2101	372	340	3877
Response rate (%)	46% CIT 68% Lit sea	40%	82%	66%	57%	48%	46%	37% ILL 36% Lit	28%	26%	81%	59%	20%
Additional quality criteria	5		4							3	2		

(b) Clinical librarian

	Giuse <i>et al.</i> , 1998 ³⁵	Booth <i>et al.</i> , 2002 ³²	Scura & Davidoff, 1981 ³⁸	Veenstra, 1992 ⁴¹	Veenstra, & Gluck 1992 ⁴²	Royal <i>et al.</i> , 1993 ³⁶	Schall & Wilson, 1976 ³⁷	Barbour & Young, 1986 ³¹	Freeth, 2002 ³³	Freeth & Smith, 2003 ³⁴
Sample size	38	72	50	33	66	51	36 NICU 26 ortho	—	110	155
Response rate (%)	100%	58%	96%	91%	65%	60%	83% NICU 58% ortho	76%	35%	33%
Additional quality criteria	4		3				2			

Table 4 Impact measures

(a) Reported changes in patient care: traditional library

% response Multiple responses allowed in studies	Urquhart & Hepworth, 1995 ²⁸ (library searches)	Davies <i>et al.</i> , 1997 ¹⁹	Lovas <i>et al.</i> , 1991 ²³	Qual. Devel. Team, 2003 ²⁵	King, 1987 ²¹	Wilson <i>et al.</i> , 1989 ²⁹	Marshall, 1992 ²⁴	Scolaro, 1995 ²⁶	Ali, 2000 ¹⁴	Webster Fischer & Reel, 1992 ²⁷	Burton, 1995 ¹⁶	Johnson, 1995 ²⁰	Casado Urigen <i>et al.</i> , 1994 ¹⁷	Range (range in studies meeting 4–5 quality criteria)
General impact on clinical care	79	—	47	89	94	—	97	37 ILL 62 Lit s	82	—	—	—	—	37–97 % (37–97%)
Handled case differently (definitely/probably)	25	—	—	—	74	—	—	—	75	—	—	—	—	25–75 % (25–75%)
Diagnosis	31	—	—	—	—	16	29	—	10	—	93	14	58	10–93 % (10–31%)
Choice of tests	22	—	—	—	—	—	51	—	20 lab 24 other	48	35	13	—	13–51 % (20–51%)
Choice of drugs/therapy	—	—	—	—	—	—	45	—	27	—	40	13	—	13–45 % (27–45%)
Diagnosis and treatment/ management	32	—	—	—	—	25	—	—	57	50	—	38	61	25–61 % (25–57%)
Reduced length of stay	—	—	—	—	—	—	19	—	10	—	20	—	—	10–20 % (10–19%)
Advice to patients	—	—	—	—	—	—	72	—	47	—	54	—	—	47–72 % (47–72%)
Important changes in care/alternative therapies/ referral	35	—	—	—	—	11	—	—	54	—	—	—	—	11–54 % (11–54%)
Initial assessment	—	45	—	—	—	—	—	—	—	—	—	—	—	—
Improved quality of life for patient/carer	—	68	—	—	—	—	—	—	—	—	—	—	—	—

(b) Reported benefits: traditional library

%	Wilson <i>et al.</i> , 1989 ²⁹	Marshall, 1992 ²⁴	Ali, 2000 ¹⁴	Burton, 1995 ¹⁶	Casado Urigen <i>et al.</i> , 1994 ¹⁷	Range
Avoided:						
Hospital admission	1.6	12	11	10	17	1.6–17%
Patient mortality	—	19	—	—	—	—
Hospital-acquired infection	—	8	8	—	25	8–25%
Surgery	—	21	19	—	34	19–34%
Additional/unnecessary tests or procedures	13	49	23	30	28	13–49%
Additional outpatient visits	—	26	12	—	40	12–40%
Transfer to another hospital	—	—	—	12	—	—
... or reduced risks	7	—	—	—	—	—
Saved:						
Physicians' time	—	—	—	—	49	—

Table 5 Impact measures: clinical librarian

(a) Reported changes in patient care: clinical librarian

Multiple responses allowed in studies (%)	Giuse <i>et al.</i> , 1998 ³⁵	Booth <i>et al.</i> , 2002 ³²	Scura & Davidoff, 1981 ³⁸	Veenstra <i>et al.</i> , 1992 ⁴²	Schall & Wilson, 1976 ³⁷	Barbour & Young, 1986 ³¹	Freeth, 2002 ³³	Freeth & Smith, 2003 ³⁴	Range
Impact on clinical care/higher quality care/better informed decisions	√	—	20	—	—	—	—	—	—
Diagnosis	—	62	—	37	—	95	—	—	37–95%
Choice of drugs/ therapy	—	—	—	51	67 Ortho 97 NICU	—	—	—	51–97%
Diagnosis and treatment/ management	—	85	—	30	—	—	—	—	30–85%
Reduced length of stay	—	29	—	—	—	—	√	—	—
Advice to patients	—	74	—	—	—	—	—	—	—

(b) Reported benefits: clinical librarian

Multiple responses allowed in studies (%)	Giuse <i>et al.</i> , 1998 ³⁵	Booth <i>et al.</i> , 2002 ³²	Scura & Davidoff, 1981 ³⁸	Veenstra, <i>et al.</i> , 1992 ⁴²	Schall & Wilson, 1976 ³⁷	Barbour & Young, 1986 ³¹	Freeth, 2002 ³³	Freeth & Smith, 2003 ³⁴
Avoided:								
Referral	√	—	—	—	—	—	√	—
Re-admission	—	—	—	—	—	—	√	—
Saved:								
Health professionals' time	—	√	—	—	—	86	√	√
Money	—	√ ^{CS}	—	√ ^{CS}	—	—	√	—

√, Positive but unquantified effect; √^{CS}, estimates of cost savings were made (see text).

Study quality was variable within both research areas; clinical librarian studies were generally smaller, with poorer quality standards and results were less likely to be quantified. Further study is therefore indicated. Criteria for limiting sampling, recall and researcher bias (additional quality criteria) were used, along with sample size and response rate for a crude ranking of studies (Table 3). Although it should be stressed that the relative importance of each of these criteria is not proven, a broad ranking of study quality could be estimated in this way. Good research practice also dictates that measures should be taken to reduce sources of bias within a research project as far as is possible, and this good practice has been established on an international level.^{9–11}

Only one randomised controlled trial was found during the literature search and it is notable that this was carried out more than 20 years ago!⁴³ No patient outcomes were reported, so the study was

excluded from this review. It does, however, provide an example as to how a randomised controlled trial can be carried out to examine a radical change to a library service. One included study contained a control group (Klein).²² Although a potential confounder of this study is that the cases associated with an early literature review were those that were more likely to have excellent all-round care (and thus the shorter stay in hospital could have been associated with a number of influences), it shows that the controlled study is feasible within this setting. Such methods shouldn't be excluded when research projects are under consideration, although the organisation and time required by such a study preclude its inclusion within a pragmatic user survey for general library use.

Conclusions from this study and from earlier literature reviews^{3,4} are that, in designing impact studies, qualitative as well as quantitative information should be considered. Qualitative data, using

appropriate methodologies to ensure rigorous gathering, analysis and presentation of data, provide the grounding for quantitative approaches by identifying useful indicators.^{44–46} The specific or general use design, with follow-up user interviews, provide a practical and appropriate methodology when all possible attempts to reduce bias are included.

Responses are inevitably reported subjectively by the health professionals and opportunities to acquire 'hard data' from patients are limited. The validity of results can be strengthened, however, by gathering and comparing quantitative data from a survey with supporting qualitative information from user interviews. Given the difficulties in collecting hard data on patient outcomes it is recommended that questions covering the effect of information on other important outcomes should be developed with the input of library users. These could include the effect on professional development, influence on key decision makers and/or in the preparation of local guidelines, and savings to the organisation including staff time.^{1,2,4}

If respondents are asked to reply on the basis of a specific and recent instance of library use/information provision, rather than library use in general, this reduces the complexity of the task being undertaken. The requirement for fixed responses over-simplifies the complex nature of decision making, but this is mitigated somewhat by ensuring that the responder is thinking of a single incident of information use rather than a range and may provide a more accurate reflection of need and use.^{47–49} This technique (the critical incident technique) has been validated and used in more than 700 studies.²⁹ In addition, there are indications that different user groups should be considered or analysed separately. There may be important differences in benefit to particular user groups that might be excluded in an overall result.³

An opportunity to compare results across different types of health library services would be enhanced if a core set of questions were agreed and validated at the national or even international level. For the measurement of user views on service quality, this has been achieved by the LibQUAL instrument, based on SERVQUAL developed by Texas A&M University Libraries⁵⁰ (<http://www.libqual.org>). These could then be shared across studies to allow for direct comparison

of results. It can be seen from Table 4 that a range of different questions were asked. Language and terminology varied a great deal from study to study, making a comparison of results across studies difficult. A core set of questions will be relevant to studies of both traditional library and clinical librarian services. Additional questions of particular relevance to clinical librarian services include those of time saved by health professionals and hence the effectiveness and cost-effectiveness of the service.

There are several suggestions for future research within the traditional library setting. Library services are moving rapidly towards electronic or 'virtual' services. Thus, it is important to carry out and pool studies that compare traditional (librarian/clinical librarian) searches carried out on behalf of health-care staff with searches carried out by the health-care staff themselves (end-user searches) using networked services provided by the library, and for which support and training have been provided. Studies suggest that librarians usually retrieve more relevant citations than physicians and health professionals themselves have said that searches carried out by clinical librarians have added value compared with those that they carry out themselves.³ The issues of efficiency and professional time saved/cost-effectiveness will then be an important outcome, along with health outcomes, in as far as these can be measured.

It would also be useful to compare the various models of clinical librarian services ranging from those offered to users coming in to the library, attendance at ward rounds, on grand rounds and so on, to investigate the most valued and cost-effective methods of delivery in terms of benefits for health-care staff and for patients.

This review looked only at one aspect, albeit a very important aspect, of the service provided by health-care libraries. It is clearly appropriate to measure the impact of a health library service in terms of its effect on patient care despite the inherent difficulties of obtaining objective measures. Traditional library services will continue to provide, in addition, a resource for academic learning, research, administration and management, patient information, continuing professional and personal development, clinical teaching, guideline development and so on. Service quality and impact can be

assessed by benchmarking services against measures of good practice as, for example, in the Health Libraries and Information Confederation's (HeLicon's) tool for the accreditation of library and information services in the health sector (<http://www.nelh.nhs.uk/librarian/accreditation.asp>). One important aspect of such an assessment is the direct impact of the service on the users and those they care for.

The LKDN Quality and Statistics Group is working with librarians in and beyond the UK to develop and validate a pragmatic but high-quality user survey instrument to measure the effect of the impact of a library service on its users. The survey will include, among other important measures, questions regarding direct outcomes to patients, to get the full picture of the value and impact of a health library service.

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Appendix

An appendix to this paper is available on the Blackwell Publishing website at <http://www.blackwellpublishing.com/products/journals/suppmat/HIR/HIR549/HIR549sm.htm>

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Key Messages

Implications for Policy

- Evidence of the impact of professional library services on health outcomes for patients and time savings for health-care staff is available and can be used to demonstrate the impact of library services to users, managers and funding bodies.
- An opportunity to compare results across different types of health library service would be enhanced if a methodology, including a core set of questions, were agreed and validated at a national, or even an international, level.

Implications for Practice

- Practical guidance can be gathered from existing impact studies to improve the quality of further research.
- A practical reliable survey methodology could also be used, at a local level, to provide evidence of the impact of the library service on a range of outcomes and to guide further developments.