

## REVIEW ARTICLE

# Critical incident technique helps determine how health library and information services influence clinical decision making and patient care: A literature review

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**Abstract**

**Background:** The Critical incident technique (CIT) has been used for decades in the assessment of the impact of library and information services on patient care and clinical decision making.

**Objectives:** The purpose of this article is to identify and review the studies that have used CIT approach to assess the impact of library and information services on patient care and clinical decision making.

**Methods:** Related articles were searched in the information resources of Web of Science, PubMed, Embase, Scopus, Google Scholar and LISTA. Results: From among 1346 articles obtained, 22 met the inclusion criteria. The analysis of the articles indicated that CIT has been used for various purposes such as assessing the information value, assessing the information resources and librarians in their clinical practice and decision making, examining information-seeking behaviour and analysing cost- benefits.

**Discussion:** Critical incident technique is a flexible approach for libraries and information services, based on individuals' experiences of finding and using information to help resolve a perceived problem.

**Conclusions:** The studies identified in this review offer a variety of methods for using CIT that other libraries might consider for their own impact studies.

**KEYWORDS**

clinical decision making; critical incident; impact; literature; patient care; review; surveys

## INTRODUCTION

The critical incident technique comprises a set of procedures for gathering human behaviour observations directly and largely seeks practical solutions to problems (Serrat, 2017). The historical origin of this technique goes back to organizational and industrial psychology and was innovated by Flanagan during World War II in 1940. It was the outcome of the US Air Force's psychology project for selecting and classifying the staff and aircraft pilots.

Flanagan and his colleagues sought to analyse the real incidents of success or failure in training and service return programmes and identify specific behaviours that could lead to failure or success.

Flanagan described the critical incident technique with five important stages including (1) the general aims of the studied activity and the research questions that should be carefully asked because they affect data collection and analysis, (2) plans and specifications, which include the necessary preparations before data collection,

(3) data collection, which can be done in various ways, including observation, record forms, questionnaires and interviews. With observation, the researcher collects the necessary information by observing the work of individuals who perform a specific task. Registration forms are another way for data collection in this technique. These forms contain detailed information about the studied incident. Of course, direct observation and record forms are useful for assessing the explicit behaviour of individuals. These methods are less effective for cases where individuals' behaviour is invisible, including cognitive activities such as decision making and planning. The questionnaire also has benefits, including the fact that many individuals can participate in the research, and on the other hand, the participant can view their answers and remain anonymous. However, some individuals to whom the questionnaire is sent may not have adequate time to describe and compile the incidents and avoid participating in the study or provide inadequate details of the incident. In the interview, which can be conducted individually or in groups, the interviewees are asked to report on the latest incidents that happened to them by referring to their memory. In this method, a deep understanding of individuals' experiences of incidents is obtained, there is a possibility of discussion, and the interviewees can also record the non-verbal behaviours of the interviewees, (4) data analysis, which according to the opinions of many researchers is the most important stage and depends on the method of data collection. For example, for qualitative data, several measures can be used such as recording the statements of interviewees, sorting and categorizing data into groups and subgroups, validation and other activities related to qualitative approaches; and (5) interpret and report the results, which should begin with a review and evaluation of the previous four stages. At this stage, the limitations are discussed and the validity of the final results is confirmed (Flanagan, 1954).

After World War II, this technique, in addition to its utility for determining job requirements, was used in assessing expertise, selecting and classifying human resources, designing jobs, counselling and psychotherapy (FitzGerald et al., 2008). Recently, it has been used in studying a variety of topics among them the examination of value and impact of service delivery in different fields, and particularly to show the value and impact of library and information services on patient care and clinical decision making (Bartlett & Marshall, 2013; Sakai et al., 2018). A rich body of knowledge has been created in this field, but there is no coherent knowledge about the goals and application of this method to assess the value and impact of library and information services on patient care and clinical decision making.

### Key Messages

- It is necessary to make researchers familiar with the required techniques to fill the thematic and geographical research gaps.
- Considering the user-centrality of the critical incident technique, its application should be extended in librarianship research to improve librarianship and information services.
- Critical incident technique is an appropriate approach to assess the value of information, information resources and librarians in clinical practice.
- Most studies using critical incident technique examine the information-seeking behaviours of clinical staff.

## METHODS

The present study was carried out through a literature review. To do so, six sources including Web Of Science, PubMed, Embase (Via Elsevier), Scopus, Google Scholar and LISTA (Library, Information Science & Technology Abstracts) were searched (in December 2019 and updated in November 2020) through the following strategy:

(value OR impact\* OR effect\* OR usefulness) AND library\* AND ("clinical decision making" OR "clinical setting\*" OR "healthcare setting\*" OR "clinical care" OR "patient care") AND ("critical incident technique" OR "critical event technique" OR "critical incident report")

The search strategy in the information sources used is as follows (Table 1).

### Inclusion criteria

The inclusion criteria were those that have evaluated, with CIT method, the value and impact of library and information services on patient care and clinical decision making.

### Exclusion criteria

- Non-research texts such as letters to the editors
- book reviews
- inaccessible full text
- non-English articles
- and those that have not used CIT method

TABLE 1 Searching strategy used in various sources

Source	Search strategy
Web Of Science	TOPIC: (value OR impact* OR effect* OR usefulness) AND TOPIC: (librar*) AND TOPIC: ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") AND TOPIC: ("critical incident technique" OR "critical event technique" OR "critical incident report")
PubMed	((value OR impact* OR effect* OR usefulness) AND (librar*)) AND ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") AND ("critical incident technique" OR "critical event technique" OR "critical incident report")
Embase (via Elsevier)	(TITLE-ABS-KEY (value OR impact* OR effect* OR usefulness) AND TITLE-ABS-KEY (librar*) AND TITLE-ABS-KEY ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") AND TITLE-ABS-KEY ("critical incident technique" OR "critical event technique" OR "critical incident report"))
Scopus	(TITLE-ABS-KEY (value OR impact* OR effect* OR usefulness) AND TITLE-ABS-KEY (librar*) AND TITLE-ABS-KEY ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") AND TITLE-ABS-KEY ("critical incident technique" OR "critical event technique" OR "critical incident report"))
Google Scholar	(value OR impact* OR effect* OR usefulness) librar* ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") ("critical incident technique" OR "critical event technique" OR "critical incident report")
LISTA Via EBSCOhost	TX (value OR impact* OR effect* OR usefulness) AND TX librar* AND TX ("clinical decision making" OR "clinical setting*" OR "healthcare setting*" OR "clinical care" OR "patient care") AND TX ("critical incident technique" OR "critical event technique" OR "critical incident report")

A sum of 1346 articles was retrieved from six sources out of which 52 were duplicates. Thus, 1294 articles remained out of which 1131 were removed due to the irrelevant Title and Abstract. Of the remaining 163 articles, 140 were removed after full-text analyses. In the end, 23 articles were selected, and the important parts of them, including findings and objectives, were studied and analysed (Figure 1).

The following are the details of the records reviewed including title, sample size, population, methodology and instrument used for the studies (Table 2).

## RESULTS

In this study, after the initial reviews, 1346 articles were obtained, from among which, 23 articles with inclusion criteria were critically evaluated. The geographical distribution of the articles showed that most of the studies were conducted in the United Kingdom (Table 3).

Methodologically, although CIT was used in the design of the Question and Answer Strategy in all the articles, they were differently conducted with three quantitative, qualitative and mixed-methods approaches. The following table shows some examples of questioning strategy in CIT used in the articles to achieve the objectives (Table 4).

In the research, eight goals have been discussed as follows.

## Assessing the information value in clinical practices

In some of the studies, factors such as qualitative, cognitive and caring values have been expressed for library information. The quality of information depends on the relevance, recency and validity of the information received or searched. Here, value refers to the profit or benefit that users derive from the use of information. In other words, the value of information refers to the effects and results of using it (Urquhart & Hepworth, 1995). In some of the studies under review, the authors have presented categories for information utility and have raised many issues including the qualitative, cognitive and caring values. The qualitative value of information relates to the degree of relevance, recency and credibility of the information that is received or searched. The cognitive value of information is the effect of the information sought or received about prior knowledge (Marshall, 1992; O'Connor, 2002; Urquhart & Hepworth, 1995; Wood et al., 1996). In these studies, information-seeking behaviour is regarded as a sort of knowledge process, and participants have been asked about the change of their status after seeking information in their recent clinical cases. The caring value of information also refers to the value that information possesses at each stage of patient care, including change in patient care and prevention of unpleasant outcomes (Marshall, 1992; Urquhart & Hepworth, 1995). In the

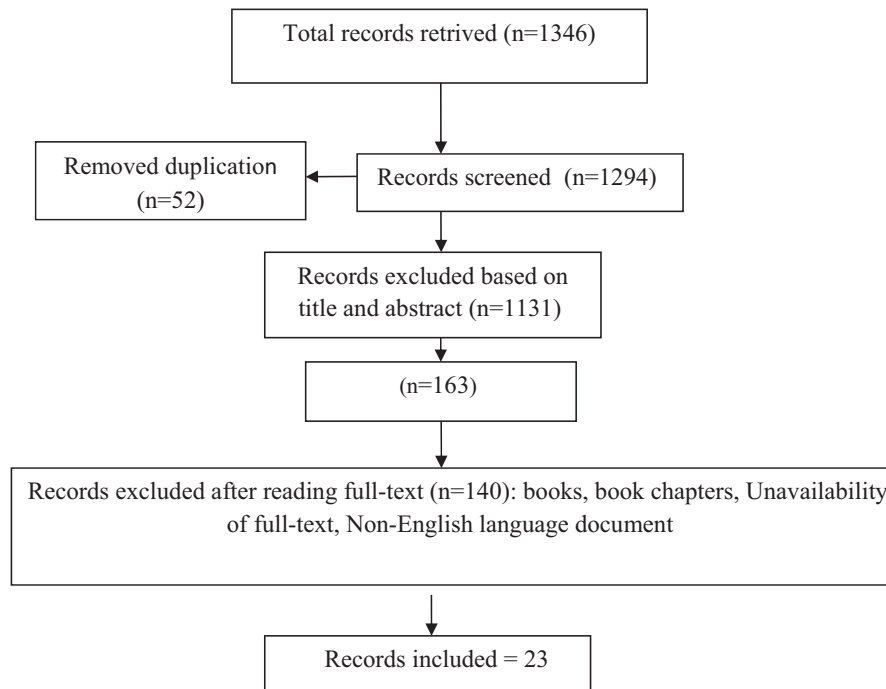


FIGURE 1 Flow chart of literature review strategy

Ashcroft study where a questionnaire and CIT was employed to assess the impact of using the information on physiotherapists' clinical decision making, the participants found that the information had a qualitative value, that is relevance (44%) and recency (66%). They also discovered that the information had a cognitive value, that is refreshing memory (55%), consolidating previous knowledge (33%) and creating new knowledge in their minds (88%). Besides, it had clinical value and improved clinical decision making (55%) and high-quality patient care (55%) (Ashcroft, 1998). Pluye and Grad (2004) also investigated the impact of information retrieval technology on physician practice using CIT and a semi-structured in-depth interview. The results of their study indicated six types of impact including reassurance, practice improvement, confirmation, learning, frustration and recall.

### Recognizing the information value in clinical decision making

Information is important in physicians' clinical decision making from two aspects: immediate and future impact. The immediate impact of information relates to the matching that exists between the information provided, the users' current knowledge and immediate use of information, that is when a clinical problem arises and the users get involved in seeking information. On the other hand, concerning the retention of this information in

memory and the likelihood of using it in similar clinical instances, it may also influence their future clinical decision making. In this regard, Urquhart and Hepworth (1995) conducted a study on the impact of information that was provided by health libraries on physicians and their clinical decision making, using CIT, questionnaires and interviews. The results showed that from the physicians' viewpoint, the information they received influenced their immediate decision making, and even that it was more important in their future clinical decision making. In other words, they are more applicable just in case and not just in time (Urquhart & Hepworth, 1995).

In another study, Urquhart and Davies (1997) used questionnaires, interviews and CIT to examine the value of information in developing knowledge and the current and future clinical practice of nurses, midwives and health visitors. The results showed that information affected the reduction of uncertainty in making decisions about a particular clinical problem. 96% of the respondents also agreed that information affected their future practice by enhancing their skills (Urquhart & Davies, 1997).

### Examining the role of information resources in solving clinical problems

The review of the studies indicated the application of CIT to evaluate the effect of using a specific database or information resource on solving clinical problems. In

TABLE 2 List of articles reviewed

Title	Author	Year	Population	Location	Research tools
The impact of the hospital library on clinical decision making: the Rochester study	Marshall	1992	448 physician	Rochester, New York	Questionnaire/Critical Incident Technique
Use of MEDLINE by Physicians for Clinical Problem Solving	Lindberg, Siegel, Rapp, Wallingford & Wilson	1993	552 physicians, scientists, and other professionals working in a variety of clinical care and other settings	United States, California, Arizona, Nevada, and Hawaii	Telephone Interviews/Critical Incident Technique
The value of information supplied to clinicians by health libraries: devising an outcomes-based assessment of the contribution of libraries to clinical decision-making	Urquhart & Hepworth	1995	775 Physician in 15 hospital areas (urban and rural)	British	Interviews, Questionnaire/Critical Incident Technique
Comparing and using assessments of the value of information to clinical decision making	Urquhart & Hepworth	1996	300 clinicians (hospital and community staff, including general practitioners)	British	Questionnaire, Interviews/Critical Incident Technique
The impact of information on clinical decision making by General Medical Practitioners	Wood, Wright & Wilson	1996	38 general medical practitioners	British Library Research	Depth Interviews/Critical Incident Technique
EVINCE: The value of information in developing nursing knowledge and competence	Urquhart & Davies	1997	Random sample of nursing professionals	British	Questionnaire, Interviews/Critical Incident Technique
The impact of information use on decision making by physiotherapists	Ashcroft	1998	1460 Physiotherapists in 37 NHS Trust hospitals in the Northern and Yorkshire region of England	British Northern and Yorkshire Region	Postal Questionnaire/Critical Incident Technique
An evaluation of information-seeking behaviors of general pediatricians	D'Alessandro, Kreiter & Peterson	2004	52 participated (41 residents and 11 faculty)	United States Midwest	Semistructured Telephone Interview/Critical Incident Technique
How information retrieval technology may impact on physician practice: an organizational case study in family medicine	Pluye & Grad	2004	6 physician	Canada	Interview/Critical Incident Technique
Measuring the impact of healthcare information services	Robinson & Bawden	2007	66 (Doctor 19, Nurse 25, Allied profession 12, Other 10)	London	Questionnaire (Users) Interview (librarian)
Information-seeking behavior of medical residents in clinical practice in Bahia, Brazil	Martinez-Silveira and Oddone (2008)	2008	120 residents	Brazil	Questionnaire/Critical Incident Technique



TABLE 2 (Continued)

Title	Author	Year	Population	Location	Research tools
Measuring the value and impact of health sciences libraries: planning an update and replication of the Rochester Study	Dunn, Brewer, Marshall & Sollenberger	2009	Physicians, residents, and nurses, librarian	New York	Email survey and semi-structured interviews, librarians (focus groups and analysed by a facilitator)/ Critical Incident Technique
The Value of Library and Information Services in Patient Care: Canadian Results From an International Multisite Study	Bartlett & Marshall	2013	1231 (physicians, residents, nurses and nurse practitioners), librarian	Canada	Mixed-methods: Focus Groups, Web-Based Survey, Follow-Up Interviews/ Critical Incident Technique
The value of library and information services in patient care: results of a multisite study	Marshall and et. al.	2013	16,122 physicians, residents, nurses and nurse practitioners, librarian	Canada	Multiple Methods: Focus Groups of Librarians; Web-Based Survey of Physicians, Residents, and Nurses; and Twenty-Four Follow-Up, Semi-Structured Interviews and Telephone Interviews/ Critical Incident Technique
Library and information services: impact on patient care quality	Marshall, Morgan, Thompson & Wells	2014	4520 physicians and residents at 56 library sites serving 118 hospitals	United States and Canada	Web-Based Survey/Critical Incident Technique
The Value of Library and Information Services in Nursing and Patient Care	Marshall, Morgan, Klem, Thompson & Wells	2014	6788 nurses	United States and Canada	Web-Based Survey/Critical Incident Technique
Evaluating the Impact of Clinical/Management Librarian Service in a UK Teaching Hospital	Reid	2014	204 questionnaires (all users of the service). 5 interviews (professionals who had used the service in the subsequent 6 month period) and 3 interviews (management librarian)	United Kingdom	Questionnaire and Semi-Structured Interview Based On The Critical Incident Technique
The impact of clinical librarian services on patients and health care organisations	Brettle, Maden & Payne	2016	16 Clinical librarians	England	Interviews Questionnaires/ Critical Incident Technique
Examining the role of MEDLINE as a patient care information resource: an analysis of data from the Value of Libraries study	Dunn, Marshall, Wells & Backus	2017	16,122 Physician, residents, nurse	Bethesda	Questionnaire/Critical Incident Technique

TABLE 2 (Continued)

Title	Author	Year	Population	Location	Research tools
Evaluation of hospital staff's perceived quality of librarian-mediated literature searching services	McKeown, Konrad, McTavish & Boyce	2017	237 health sciences centre staff	Canada	Questionnaire/Critical Incident Technique
Clinical usefulness of library and information services in Japan: The detailed use and value of information in clinical settings	Sakai et al. (2018)	2018	598 valid responses (275 physicians, 55 residents, and 268 nurses)	Japan	Web-Based Survey, Interview/Critical Incident Technique
Demonstrating Value in Federal Medical Center Libraries	Taylor & Stephenson	2018	Clinical staff	United States	Online Questionnaire/Critical Incident Technique
The value of librarians for clinical and health governance (a view from Europe)	Ibragimova & Korjonen	2019	83 Librarians from 25 European countries	European countries	Critical Incident Technique/Questionnaire

most of the studies of this group, the impact and value of using databases, including Medline, was examined in cases where the medical staff needed information. For example, Lindberg et al. (1993) examined the impact and value of 552 physicians and patient care practitioners' use of the Medline database on solving clinical problems. In this qualitative study, the researchers interviewed the physicians, on the phone and through CIT, about the reasons why they used this information database and the impact of the information they received on their clinical decision making and patient care. The results showed that the Medline database was used to address a wide range of clinical information needs. Moreover, in critical contexts where there was an urgent need for information, the Medline database has proved to be effective for patient care and disease outcome (Lindberg et al., 1993). In 2017, Dunn, Marshall, Wells and Baccus, using CIT, evaluated 16,122 physicians, nurses and other clinical staff in 118 hospitals on the role of information resources, including the Medline database, in disease care and prevention of adverse events. The participants were asked to respond to the questions based on a specific patient care context in which they required information beyond what was there in the patient's record, electronic medical records or laboratory results. The results of their study indicated that using the Medline Database was effective in preventing adverse events, changing patient care methods and answering clinical questions (Dunn et al., 2017).

### Investigating the librarians' role in the patients' clinical outcome

McKeown et al. (2017) examined, through an empirical online survey, the perceived quality of the librarians' information search services over a year with the participation of a hospital staff that was sampled systematically. In their study, the participants were asked to respond to the questions based on the results of the information search experiences they received from the librarian. The results showed that 54% of the participants were extremely satisfied with the librarians' information search services, 45% rated the results 75%–100% relevant and accurate, and 42% rated the information utility as excellent (McKeown et al., 2017). Reid (2014) evaluated the impact of clinical librarian services at a university hospital in the UK with the help of 204 physicians, nurses and other clinical practitioners, using semi-structured interviews and questionnaires. The results revealed that in 41% of the events, the clinical librarian was directly engaged in disease consequences including diagnosis and choice of intervention or test. In 32% of the cases, the direct participation of the

TABLE 3 Geographical location of the articles reviewed

Location	Studies
United Kingdom	Ashcroft (1998), Brettle et al. (2016), Reid (2014), Robinson and Bawden (2007), Urquhart and Hepworth (1995), Urquhart and Hepworth (1996), Wood et al. (1996), Urquhart and Davies (1997)
United States	Lindberg et al. (1993), D'Alessandro et al. (2004), Dunn et al. (2009), Dunn et al. (2017), Taylor and Stephenson (2018), Marshall (1992)
Canada	Bartlett and Marshall (2013), Marshall et al. (2013), Pluye and Grad (2004), McKeown et al. (2017)
USA and Canada	Marshall, Morgan, Klem et al. (2014), Marshall, Morgan, Thompson et al. (2014)
Japan	Sakai et al. (2018)
Brazil	Martinez-Silveira and Oddone (2008)
European countries	Ibragimova and Korjonen (2019)

TABLE 4 The objectives and examples of the questioning strategy to achieve them

Objectives	Question & answer strategy	Studies
Assessing the value of information in clinical practices	<p>How was the quality of the information you searched in your recent clinical cases? Was it relevant? Precise? Updated?</p> <p>How was the cognitive value of the information you searched in your recent clinical cases? Did the information refresh your memory? Did the information confirm your previous knowledge or belief? Did you acquire new knowledge through searching for information?</p> <p>How was the caring value of the information you searched in your recent clinical cases? Did the information you searched have any impact on the quality of patient care? And...</p>	Ashcroft (1998), Marshall (1992), Pluye and Grad (2004)
Investigating the role of information resources in clinical problem solving	<p>In these studies, the medical situations that triggered information need are regarded as critical incidents.</p> <p>Can you think of and respond to a recent example in which you acquired information through Medline database?</p> <p>Was your search of information in Medline useful in clinical events and situations?</p> <p>What conditions persuade you to search for information in the Medline database?</p> <p>What specific information did you retrieve from the Medline database?</p> <p>Why did you decide to search for information in the Medline database instead of consulting with a colleague, using textbooks, etc.?</p> <p>Has the use of information resources, including the Medline database, prevented unintended events like hospitalization, surgery, testing, imaging, additional diagnosis, death, etc.?</p>	Dunn et al. (2017), Lindberg et al. (1993)
Investigating the role of librarians in patients' clinical outcome	<p>In these studies, each search for information requested from the librarian is regarded as a critical incident, and the research questions are formulated as follows.</p> <p>Respond to the questions by focusing on the information you requested from the librarian to solve your clinical problem in the past six months.</p> <p>How was the information you received from the librarian to respond to your clinical question?</p> <p>Has the librarian's help in clinical practice made you manage every aspect of the clinical situation differently?</p> <p>Has the librarian's help in patient care prevented medical errors? And...</p>	Brettle et al. (2016), McKeown et al. (2017)
The role of information in lowering patient care and medical errors	Which of the following adverse incidents have the search for information about recent clinical cases prevented? Patient's misinterpretation of his/her disease, additional medical tests or procedures, drug interaction, misdiagnosis, medication error, patient mortality, hospitalization, re-hospitalization, surgery, cultural misconception, nosocomial infection, etc.	Marshall (1992), Marshall et al. (2013), Sakai et al. (2018)

(Continues)



TABLE 4 (Continued)

Objectives	Question & answer strategy	Studies
Investigating the impact of information on the course of patient care	How has the impact of using information in recent clinical cases been on patient care and its consequences, including change in patient advice, drug selection, diagnosis, test selection, post-hospital care or treatment, varied management of situations, length of hospitalization, etc.?	Ashcroft (1998), Marshall (1992), Marshall et al. (2013), Urquhart and Hepworth (1996), Wood et al. (1996)
Investigating the information-seeking behaviour of clinical staff	In these studies, the models for information need and use are examined, and questions are frequently asked in the following framework Focus on a specific clinical case in the past six months that stimulated you to seek information and respond to the questions 'Think back to last night (or clinic today). What question(s) did you have last night (or today) for which you needed additional information to answer?' What kind of information did you need? For what clinical decision making conditions did you need information? What information resources did you use? How successful were you in seeking information? And ...	D'Alessandro et al. (2004), Martinez-Silveira and Ouddone (2008), Sakai et al. (2018), Wood et al. (1996), Urquhart, and Davies (1997)
Cost-benefit analysis of information in clinical practice	Did the information you received help you to have a cost-effective clinical performance? Did the information you received in the clinical incident or event help you to save more time?	Urquhart and Hepworth (1996), Marshall (1992), Marshall et al. (2013), Taylor and Stephenson (2018), Urquhart and Hepworth (1995)
Investigating the importance of information in clinical decision making	Did the information you received have an impact on your current clinical decision making? Did the information you received influence your future clinical decision makings? In what specific ways was information helpful in your decision making?	Urquhart and Hepworth (1995), Lindberg et al. (1993)

clinical librarian was effective in increasing the quality of life, patient participation in clinical decision making and access to information. In 32% of the cases, it was effective in reducing costs and managing risk, in 25% of the cases, it was effective in preventing tests and re-admission, and in 21% of the cases, it was effective in reducing the hospitalization stay (Reid, 2014). Brettle et al. (2016) also assessed through CIT the impact of clinical librarian services on health and patient care providers, using questionnaires and interviews. The results indicated that the librarians' direct participation was effective in choice of intervention (36%), diagnosis (26%), quality of life (25%), increased patient involvement in clinical decision making (26%), cost savings and risk management including prevention of additional tests, referrals, admission and shortening the hospitalization stay (28%) (Brettle et al., 2016).

Elsewhere, Ibragimova and Korjonen (2019) assessed the value of librarians in clinical governance through CIT, using a questionnaire. The results showed that librarians support clinical effectiveness and research (98%),

education (96%), patient support (84%), staff management (72%), use of IT and information (77%), risk management (38%), clinical audit (32%) and support of other aspects of clinical governance (48%) (Ibragimova & Korjonen, 2019).

### Examining the role of information in reducing health care and medical errors

Based on the findings of some of the articles under review, using library information and resources can prevent many clinical errors and additional steps in the course of patient care, thus greatly saving time and costs. Based on a recent incident of seeking information about patient care, Marshall et al. (2013) conducted a survey with 16,122 physicians, residents and nurses using a questionnaire and telephone interview. The results showed that using information in the course of patient care prevented some adverse events such as patient misunderstanding of diseases (23%), additional testing (19%), misdiagnosis (13%),

adverse drug reactions (13%), medication errors (21%) and mortality (Marshall et al., 2013).

In another study on the clinical utility of library and information services in Japan which was carried out with the help of 598 physicians, residents and nurses, using CIT, a web-based questionnaire and interviews, the participants claimed that using information in most cases prevented additional procedures and testing (37.2%), adverse drug reaction or interaction (33.8%), patient misinterpretation of disease (25.9%), misdiagnosis (7.9%), hospital admission (6.9%), patient mortality (5.4%), surgery (5.7%), nosocomial infection (4.4%) and medical errors (2.8%) (Sakai et al., 2018).

### **Evaluating the impact of information on patient care process**

Library information resources contain instructions and guidelines to assist physicians in various stages of clinical decision making, including diagnosis, prognosis and treatment, so their use by physicians at the clinic can change the treatment process (Marshall, 1992; Urquhart & Hepworth, 1995; Wood et al., 1996). The results of the surveyed studies also confirmed this, as in the study of Marshall et al. (2013), in which, three-fourths of the participants stated that as a result of using library information in the clinic, they could manage the various aspects of the caring conditions differently than before. These alterations were mostly concerned with diagnosis (25%), choice of drugs (33%), other treatment (31%) and tests (23%). In another study that was conducted on 1500 physiotherapists, using a questionnaire and CIT, it was reported that the use of information created positive changes in treatment selection (53%) and patient advice (59%) (Ashcroft, 1998).

### **Investigating the clinical staff's information-seeking behaviour**

Understanding the information-seeking behaviour of users is one of the important concerns in the field of librarianship and information because this perception plays a key role in providing better services to users and designing appropriate information systems. In most studies using this technique, the information-seeking behaviour of the participants was examined, who were mostly from among the medical staff. In these studies, participants were asked about the type of information required and the information resources used in their recent information searching experience to solve clinical problems. They responded to the questions based on the recall technique. For example, to examine the clinical usefulness of the library and

information services, Sakai et al. (2018) used CIT to observe the behaviour of physicians, residents and nurses about specific clinical care for a period of 6 months. In this study, the participants were asked about the type of information they used, information resources, search locations and access points, as well as the value of information. The participants responded to the questions based on the recall technique (Sakai et al., 2018).

In another study on the impact of information on physicians' clinical decision making, Wood et al. (1996) also examined their information-seeking behaviour in their recent clinical cases based on CIT (Wood et al., 1996). Also, D'Alessandro et al. (2004) investigated the general paediatricians' information-seeking behaviours in using computers and digital libraries before and after the educational intervention. The results showed that in 71.8% of the cases, finding the answer was effective in patient care. Informal consultations with the faculty, computer resources, textbooks and handbooks were the most common resources that both groups used (D'Alessandro et al., 2004).

In another study in Brazil, Martinez-Silveira and Ouddone (2008) examined the information retrieval behaviour of 120 residents with a CIT and questionnaire. The results showed that the information they most commonly needed was related to medication (44%) and diagnosis (21 patients, 29%). What motivated the residents to search for information in the previous 30 days were doubt (71%) and rare medical cases (52%, 71%). Among the information resources, residents mostly use textbooks. They also found it necessary to have a book or a computer with an internet connection near the clinical floor to support clinical practice (Martinez-Silveira & Ouddone, 2008).

### **Analysing the information cost-benefit in clinical practices**

Among the results of the articles under study, saving time and money are frequently highlighted in many of the studies. For example, Bartlett and Marshall (2013) assessed the value of library and information services in patient care process. For that purpose, they employed web-based research and, through CIT, focussed on information seeking of health service providers from 13 Canadian hospitals for a specific recent incident in patient care, as well as interviewing the librarians. According to the findings, 78.5% of the participants claimed that using library information saved their time. Librarians also stated that participating in the study not only provides potentially positive and real results for the library, but also is a positive experience. They could also use the results of the study to show the value and importance of the library to others, especially

senior managers who did not previously know about the library and the value of its services (Bartlett & Marshall, 2013). Marshall (1992) also assessed the impact of hospital libraries on clinical decision making by giving a questionnaire to 448 physicians in the city of Rochester, the United States. She asked them to use library information in their recent clinical instances and deliver an assessment report of its effect on patient care. The results showed that for 84.7% of the participants, saving time was one of the benefits of information utility (Marshall, 1992).

In addition to the above, Urquhart and Hepworth (1995) studied a wide range of aspects of the information behaviour of physicians who were members and non-members of the library. To do so, they used questionnaires and interviews and also focussed on the information they needed for patient care, teaching and lifelong education for seven working days. The interviewees found the information obtained from the library cost-effective in patient care (Urquhart & Hepworth, 1995). Taylor and Stephenson (2018) also used a questionnaire and CIT to assess the information value provided by the federal libraries for health care staff in response to their specific clinical questions and their clinical decision making. The results showed that the use of information saved the respondents' costs and time (Taylor & Stephenson, 2018).

## DISCUSSION

The purpose of this literature review is to identify and review the studies that have used the CIT approach to assess the impact of library and information services on patient care and clinical decision making. This review refers to the diverse application of CIT in quantitative and qualitative research. Using this technique quantitatively can assess the type, nature and frequency of the incidents under investigation with other types of variables and provide significant insights into the general relationships. The use of this technique in qualitative research also provides the researchers with more explanatory data that can be subjected to narrative analysis and help them with coding and categorizing data based on the qualitative approaches (Gremler, 2004). However, CIT is slightly different from other techniques. For example, unlike other qualitative techniques that focus on the description of phenomena in their naturalistic contexts, CIT studies focus more on providing solutions to practical problems (Serrat, 2017), a feature that is observable in almost all these studies. For example, in such studies, the clinical staff used the information and services of libraries and librarians to solve a clinical problem.

Moreover, CIT has been used to examine various aspects of this subject area. The Kemppainen research on

nursing in 2000 also highlighted the flexibility of this technique in solving practical problems (Kemppainen, 2000). Given that a wide variety of data collection techniques are applicable in the articles which use CIT, Viergever (2019) also considered it as an approach appropriate for different fields. Gremler (2004) also considers CIT as a flexible technique that allows researchers to study service activities in a variety of ways (Gremler, 2004). This flexibility has further been pointed out in studies by FitzGerald et al. (2008) and Viergever (2019). The results of these studies are consistent with the results of the present review.

Another result obtained in this review is the questioning technique used in the articles in which responding to the questions is based on the past and remembering the cases experienced. Thus, the participants are asked to describe actual incidents and experiences, the need for information in cases of clinical problems, use of services, information resources of libraries or librarians to remove the problem (McKeown et al., 2017). In other words, in these articles, the questions were based on the evidence as well as the respondents' lived and real experiences. This is one of the strong points of this technique which has been mentioned in various studies.

The analysis of the articles indicated that CIT has been used for various purposes such as assessing the information value in clinical practices, examining the role of information resources in solving clinical problems, investigating the librarians' role in the patients' clinical outcome, examining the role of information in reducing health care and medical errors, evaluating the impact of information on patient care process, investigating the clinical staff's information-seeking behaviour, analysing the information cost-benefit in clinical practices and recognizing the information value in clinical decision making. Although it is possible to achieve these goals through other methods, the results of the studies using those methods have proved to be more general and have not yielded precise and detailed data based on lived and real experiences as CIT does (Angelides, 2001; Fisher & Oulton, 1999; Gremler, 2004). In all the studies reviewed here, the critical incident is examined very carefully compared with other studies. For example, CIT provides an accurate tool to gain an in-depth understanding of the information-seeking behaviour of the clinical staff in specific clinical instances. This is because in this method—CIT—the researcher asks the participants about their recent clinical information seeking in specific clinical instances, puts them in their recent work and clinical context and asks them questions about their motivation behind seeking information, the specific clinical situation in which they required information, selection of information resources, types of information they needed, resources they used in various clinical situations including diagnosis, therapy, choice of drugs

and choice of test. As CIT focussed on the participants' real experiences in that context, their information needs were examined more precisely (Sakai et al., 2018; Wood et al., 1996). The questions raised in assessing the impact of information on patient care were also very detailed and explained the impact of information they received on specific clinical situations. This points out the precision of the results of these studies and, more importantly, that they were based on real. (Ashcroft, 1998; Marshall, 1992; Urquhart & Hepworth, 1995; Wood et al., 1996). Of course, collecting respondents' narratives about a particular event and focussing on real-world experiences is one of the several advantages of using this technique (Stano, 1983). This technique has other advantages too, including the fact that here, unlike other interviewing techniques, respondents are not forced to follow a certain framework when narrating their experience about an incident (Bott & Tourish, 2016). This technique emphasizes the collection of experiences and background related to a clinical case, instead of focussing on general opinion, estimation, conjecture and speculation (Lipu et al., 2007). In addition, it is a useful study methodology in situations where the cause of an incident or problem is not known, it is an inexpensive method, can be used to provide rich information about people's experience and is a flexible method and it is possible to use questionnaires and interviews in data collection (Bott & Tourish, 2016).

Like any other method, CIT has also disadvantages including self-reporting (Farrell & Mason, 2014), in which the participants (usually the clinical staff) report their information-seeking experiences to the researcher and express the value of information and services, particularly in qualitative research on a specific clinical case (Lindberg et al., 1993; Pluye & Grad, 2004; Sakai et al., 2018; Wood et al., 1996), the incidents that users recall, such as those for which they required information to solve clinical problems (Dunn et al., 2017; Lindberg et al., 1993), making queries to a clinical librarian (Hageman, 2019; Ibragimova & Korjonen, 2019; McKeown et al., 2017) and so on. This needs the participants' careful and real report (deMarrais & Lapan, 2003). As critical incidents rely on memory, they may not be true, or not reported at all. Furthermore, there is an intrinsic bias in this approach in that the incidents that have happened recently are easier to recall. Also as the emphasis of CIT is on rare incidents, a majority of frequent ones might be disregarded. Therefore, it is suggested that complementary methods such as a semi-structured interview or more accurate queries be used for an in-depth examination of the phenomenon under study, as these will allow the respondents to recall the forgotten aspects of it (Lyrakos et al., 2012).

Among other applications of CIT in assessing the clinical usefulness of libraries was the cost-benefit analysis of

library and information services in clinical practices, the results of which are consistent with those of Lancaster and Joncich (1977) who considered three levels of assessment:

1. Effectiveness assessment of how much a service meets the needs of its users. This assessment may be subjective (e.g. by gathering feedback through a questionnaire or interview), objective (such as measuring the situation) or a combination of both.
2. Cost-effectiveness assessment of a system that depends on its internal functioning. Such a study measures the effectiveness of the system; whether it is acceptable in terms of cost; or whether it meets the needs? In this type of assessment, the consequences are assessed in terms of how desirable they are for consumers, and in addition to the cost, the quality of service is also modified in terms of the users' satisfaction. This type of analysis is useful in cases where benefit is not expressible in terms of money.
3. Cost-benefit assessment is the most comprehensive economic analysis in which costs and outcomes are assessed in terms of money; whether the value of a system exceeds its costs or not. In other words, the cost-benefit analysis determines whether the benefits derived from a service justify the costs of supplying it (as cited in Hardy et al., 1985). The analysis in this review shows some of Lancaster's assessment items, and three areas of assessment can be examined in the form of CIT by surveying the target community and library service providers.

Another factor noted in assessing the cost-benefit analysis of library and information services in clinical practices is saving time for the clinical staff as a result of using librarian and library and information services to which Madden et al. (2016) pointed in their systematic review on the financial impact of clinical librarians, titled Return of Investment. The results of their study support the current research in applying CIT to examine the role of librarians in patients' clinical outcomes and the cost-benefit analysis of information in clinical practices. Their study focussed on other financial impacts of libraries as well, including the reduction in costs due to the use of librarians and library services such as reduced length of hospitalization, reduced hospital costs, reduced referral for repeated diagnostic tests and referrals to specialists. These confirm the results of investigating the role of information in reducing medical and patient care errors, which is another application of CIT in this study (Madden et al., 2016).

In this review article, CIT and its applications were introduced in the studies on assessing the value of library and information services on patient care and clinical decision making, but CIT was rarely compared with other



methods for assessing impact. Therefore, further study comparing CIT to other impact methods is recommended.

Also, this review had a number of limitations such as excluding the non-English ones, using phrasal search for specific words instead of keyword search due to the retrieval of many unintended cases, searching keywords in six information sources, of which only the LISTA database is specific to librarianship, and this might have caused the researcher to miss some articles. However, this limitation was partially removed as more results were retrieved through the Google Scholar search compared to other information sources.

## CONCLUSION

This review introduces the critical incident technique as a user-centred, experience-based and real-world data-based method, which researchers and librarians can use to explore the impact of library and information services. Therefore, in order to achieve these goals, the review explains what CIT is and how it can be used providing examples of applications to measure the impact of library services on patient care and clinical decision making.

The study results showed that in some thematic fields, few studies have been conducted using this approach, including measuring the role of librarians in clinical matters, which is very important both in the health system and especially in the evidence-based medical process and as a link between information and health professionals. Another issue that has been less addressed using this approach is investigation of the role of information resources in solving clinical problems, which are useful tools in acquiring knowledge and seeking information from physicians and clinical personnel in clinical decision making and patient care.

For geographical coverage, despite the usefulness of this method, only a small number of countries have used this approach in their research, which may be due to the little familiarity and/or unfamiliarity of researchers with this method. Therefore, due to the existence of a research gap both thematically and geographically in the application of critical incident technique for measuring the effect of library services on patient care and clinical decision making, it is suggested to familiarize researchers with this method and conduct further studies using this approach. Also, in this study, to assess the objectives discussed in most articles, the decision is based on the keywords of the article titles and no standard method has been used. Interested researchers are recommended to use more accurate thematic grouping methods in future research, including content analysis, to achieve more accurate results.

## CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

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