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User Needs and Demands of a Computer - Based Patient Record

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Abstract

Prior to the implementation of a computer-based patient record, it is necessary to outline the requirements of the medical personnel. The paper is an account of a survey on information needs and demands on computer-based patient records. The study was conducted among physicians, nursing staff and therapists in two Dutch hospitals. In order to conduct the study, a measuring-instrument in form of a questionnaire was developed. Based on the results, it may be concluded, that health service staff does not only require improved input- and consultation uses with regard to the hard copy, but is also in need of additional functions. The developed measuring instrument appeared to be a proficient aid in outlining the information needs and demands of the health service staff. Through the developed questionnaire, the staff was able to obtain an idea of the possibilities of the computer-based patient record and state their own interest in same.*

** In respect to the secrecy of the hospitals, the names are not mentioned*

Keywords

Paper-based patient record; Computerised Patient Record

Introduction

In recent years, there has been a growing interest in the computerisation of patient records. With increasing demand for information, improving technology and cheaper computer equipment [8, 14], this interest seems to be rising steadily.

The attraction for information facilities, however, should not result in an undesired and unlimited introduction of all kinds of automated information systems. Automation should not become a goal in itself. Information and the manner in which it is obtained and processed, must always be subordinate to the goal of the organisation and the needs of the individuals, who are fulfilling derivative functions of this goal. The information should therefore always be functional. When developing an information system, the information needs and demands of the individuals within the organisation must be taken into consideration [3].

The most authoritative research in this field was conducted in the United States, by the Institute of Medicine, (IOM). A multidisciplinary expert panel consisting of 115 persons, formulated a number of information needs and demands. In addition, the American Nurses Association, (ANA), carried out research among the nursing staff [5]. This study was undertaken with the help of an expert panel, consisting of 200 medical employees. Both American studies concluded, that the information demand of the medical personnel cannot be met by paper-based records. Some examples of which are: support in clinical decision-making and linking up with national data banks.

Until now, with the exception of the study by Tange, [11, 12], little research has been carried out in the Netherlands on the needs and demands of the computer-based patient record, (CPR). This is striking, as profound discussions regarding the application of a CPR in support of primary health care, have been going on for over twenty years. Tange concluded, that physicians had a positive attitude toward the paper-based patient record. The daily user is not yet convinced, that a computer-based record is superior to the present paper-based version. The paper is an account of a survey on information needs and demands among health service staff in two average-sized Dutch hospitals, with approximately 400 beds each. The departments pertaining to business economics, implement functions such as patient management- and accounting. In both hospitals, communication functions such as appointment planning and distribution of laboratory results to hospital wards are used. The hospitals are considering the use of a CPR in support of direct care. At present, the hospital does not have a computer-based information system to support health service staff in their primary tasks. An inventory of information requirements and demands among health service staff, seemed a first logical step in obtaining a CPR.

Objective, materials and methods

Objective

The objective of the study was to gain insight into the information requirements and demands of health service staff with regard to a CPR. The CPR may be defined as follows: "An electronic patient record that resides in a system specifically designed to support users by providing accessibility to complete

and acute data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids" [5]. The term information requirements refers to information needed by the user in order to perform purposefully [13]. In other words: all specifications that indicate which data is to be processed and provided [2]. Examples for medical personnel are: perception of illness, blood pressure and body temperature. Demands, also referred to as quality- or performance demands, contrary to information requirements, do not indicate the data as such, but the quality, at which data needs to be processed and provided. Here, quality refers to the conditions, which have to be met by the data and data processing procedures of the CPR. For example, speed of output, surveyability of information, degree of detail and location, where information is obtained [2, 3]. In other words: in this context, the demands refer to the efficiency of the information system.

Material and Methods

For the study, a so-called cross-section survey, also referred to as transversal survey design, was chosen [6]. In the study, the occupational group was regarded as an independent variable and information needs and demands with regard to the CPR, as dependent variables. The occupational groups were divided into the following categories: Physicians, nurses, and therapists.

Research of the literature revealed, that with regard to a CPR, no suitable measuring instruments were available to map out a complete picture of information requirements and demands of the health service staff. This led us to develop a measuring instrument ourselves. A measuring instrument was selected in the form of a structured questionnaire. This was chosen, due to the large number of persons from which data was collected, the large number of variables in form of information requirements and demands to be measured, and because the research was an opinion poll. According to Swanborn [9] and Baarda & De Goede [1], these situational factors provide a sound reason to opt for a written survey.

As in the IOM study [5], the information needs and demands were divided into the following eight categories: 1. Record Content; 2. Record Format; 3. Performance; 4. Linkages; 5. Intelligence; 6. Reporting Capabilities; 7. Control and Access; 8. Training and Implementation.

The questions were posed in a positive form. The respondents could answer these questions on an ordinal scale with five possibilities. This is also referred to as "the Literate Scale". It was decided to let the respondents give two answers to every question. The first answer possibility provided an opportunity for indicating, how much he or she agreed with the respective question on an answering scale, ranging from "very much disagree (1)" to and including "very much agree (5)". The second answer possibility provided an opportunity to indicate the relative importance of the question. Here, one could also answer on a five-point answering scale, ranging from "very unimportant (1)" to and including "very important (5)". This dichotomy is identical to the study conducted by Tange [11]. An example of a question is depicted in illustration 1.

It is easy to exchange records with different health care facilities.

Agreement:

(very much disagree 1 2 3 4 5 (very much agree)

Importance:

(very unimportant) 1 2 3 4 5 (very important)

Illustration 1 - Example of a question from the questionnaire

In order to determine the content validity of the measuring instrument, prior to distributing the questionnaire, a version of the concept was submitted to four Dutch survey experts. Based on the feedback, several questions were textually adapted, since their formulation was unclear or the question was insufficiently related to the respective information requirement and/or demand. After the adaptation, sufficient content validity could be assumed.

Table 2 - General characteristics of respondents and control variables

General characteristics / Control variables	**Hospital 1**	**Hospital 2**
Average age physicians	43	45
Average age nurses	36	37
Average age therapists	42	40
Gender physicians	Male: 86% Female: 14%	Male: 80% Female: 20%
Gender nurses	Male: 11% Female: 89%	Male: 6% Female: 94%
Gender therapists	Male: 20% Female: 80%	Male: 33% Female: 67%
Physicians' use of computers at ward, and at home (w/h)	86% / 95%	53% / 93%
Nurses' use of computers at ward, and at home (w/h)	100% / 57%	91% / 46%
Therapists' use of computers at ward, and at home (w/h)	70% / 70%	75% / 25%
Physicians who attended computer training	45%	33%
Nurses who attended computer training	77%	46%
Therapists who attended computer training	60%	17%
Physicians' attitude to computers in general (Brownbridge, 1985)	2,77	2,56
Nurses' attitude to computers in general (Brownbridge, 1985)	2,55	2,70
Therapists' attitude to computers in general (Brownbridge, 1985)	2,62	2,74

Results

General

The first hospital has a total health service staff of 395, (62 physicians, a nursing staff of 320, and 13 therapists). 235 staff members were handed a questionnaire. This sample included all physicians, (100 percent), 160 nurses, (50 percent), and 13 therapists, (100 percent). Members of the nursing staff had an equal chance to be included in the sample (P=0.5); the selection occurred at random. In total, 76 questionnaires were filled in and returned. This represented a response of 32 percent.

The second hospital has a total health service staff of 287, (44 physicians, a nursing staff of 200, and 43 therapists). All of them received a questionnaire. A total of 85 completed questionnaires were returned. This represented a response of 30 percent.

Table 1 describes a number of characteristics of the respondent groups. In addition to general characteristics, several control variables are outlined. The control variables provide insight into possible interfering effects on the research results. With regard to the control variable "attitude to computers", a validated measuring instrument by Brownbridge [4] was applied. An average rank number of (3) on this measuring instrument, indicates a neutral attitude toward computers.

The categorisation of age and gender in the sample corresponds with the categorisation of the population in the two hospitals. It is also notable, that there is big discrepancy between the private use of computers and the use of computers on the ward. Physicians use the computer more often at home, whereas nurses and therapists show a more frequent computer use on the ward. With regard to computer training, it is notable that in hospital 1, a larger number of respondents attended training on computers, than in hospital 2. The average scores with Brownbridge's measuring instrument [4], which provide an assessment of the attitude toward computers, significantly deviate from an expected average score of 3, (t-test, $p<0.05$), in all occupational groups and in both hospitals. This indicates, that a positive attitude toward computers in general, is very limited.

Specifically

The results can be subdivided into four categories, namely:

1. The current paper-based record is adequate and forms an important point of interest for a CPR, (much agreement and much interest);

2. The current paper-based record is adequate but does not form an important point of interest for a CPR, (much agreement and little interest);

3. The current paper-based record is not adequate, yet is an important point of interest for a CPR, (little agreement and much interest);

4. The current paper-based record is not adequate but does not form an important point of interest for a CPR, (little agreement and little interest).

The above categories are schematically summarised in table 2.

Table 3 - Agreement versus interest

		Interest	
		much	little
Agreement	much	1	2
	little	3	4

With regard to the information needs and demands, eight categories were established. These are already mentioned above. The specific findings are addressed per category. Within the categories, similarities and differences between the occupational groups in the two hospitals are discussed. Only those similarities and differences are discussed, which have been significantly substantiated, using the Wilcoxon matched - pairs signed ranks test. The applied confidence interval was 95 percent.

Record Content

Each of the occupational groups in both hospitals indicates a great preference for a uniform handling of basic data. This implies, that data such as name, address, date of birth, and insurance details, must be noted down and transferred to other record systems or record parts correctly. Health service staff and therapists suggest, that this is an area in which the paper-based record is not always without flaw.

The use of classification catalogues to establish clear diagnoses, generally seems of little importance to the health service staff.

Physicians, nurses and therapists indicate, that the information in the current paper-based record is often used by different members of the health service staff. This is also considered as very important.

With reference to intended medical treatment, insufficient entries are made in the paper-based patient record. With the exception of the therapist group, all occupational groups feel, that this aspect needs to be improved.

According to the nursing staff, there are not enough record entries with regard to therapy- or treatment results. The opinion of the other occupational groups is more positive. Regardless of the differing views, the reporting of therapy- or treatment results must become more efficient.

Members of the nursing staff, in particular, indicate, that the present patient record offers not enough insight into the contemplation of the health service staff, as to why a certain therapeutic remedy is applied.

Record Format

Particularly with regard to the readability of information noted down by others, the paper-based record is often inadequate. It appears, that consulting other person's records is difficult, as the handwriting is often hard to decipher.

It appears, that nurses do not obtain sufficient insight into the overall case history of the patient.

At present, health care facilities make little use of uniform record systems. A uniform patient record, which could be used

by several health care facilities, presently does not appear high on the agenda.

The opinions on inter-disciplinary use of information within the facility, differ. Nurses appear to be great advocates for an inter-disciplinary patient record, which is used within their own hospital. Physicians and therapists, incidentally, are also very enthusiastic with regard to a multi-disciplinary implementation of a uniform record.

Performance

Therapists indicate, that the record is neither accessible swiftly, nor available when required. Other occupational groups hold a more positive view. However, inadequate accessibility to records at all the work stations, is commonly conceived as a deficit.

Furthermore, it is notable that all occupational groups suggest, that they wish to take the record, (also in electronic form), to the patient's bed.

Linkages

At present, the exchange of patient records between different health care facilities appears difficult. This, however, is considered to be important.

Direct use of information from the patient record for financial and administrative purposes also seems difficult, since relevant information is difficult to trace. Also, some of the data appears to be interpretable in different ways. Physicians, in particular, attach much importance to the development of this function.

Collecting relevant data on family relatives is not easy. This, incidentally, is of little interest.

Of greatest importance is the disclosure of information, which is generated in other departments. Speedy access to laboratory- and radiology results, e.g., is considered important by all medical groups.

Intelligence

The paper-based patient record does not contain any "intelligent" functions. "Intelligent" functions, however, can influence medical care in a direct and positive way. The entire health service staff therefore indicates, that it is important to add, "intelligent" functions, such as clinical decision-making support systems, to the patient record.

Reporting Capabilities

In the present situation, access to related documents, such as .e.g. insurance documents, is already possible. Access to these kind of papers also seems required with the use of a CPR.

At present, the lay-out of the paper-based patient record is standardised per department. There does not seem to be any demand for personal, individual lay-out. Much interest is attached to a uniform design of the patient record; this also applies to the CPR.

With regard to the lay-out of standard- and individual reports, improvement seems inevitable. With a paper-based patient record, it is very time-consuming to transfer information for the lay-out of reports and letters of termination.

The addition of images, such as X-ray photographs, is desired in the future use of a CPR. At present, picture material is added to paper-based records on a small scale only.

Control and Access

For patients and lawyers, it is not always easy to gain access to patients' records. As far as nurses and therapists are concerned, this aspect should be improved. Physicians do not appear much in favour of a relaxation of the policy on access to records. In other words: it should not become easy for patients and lawyers, to gain access to patients' files.

It further seems, that in the area of data protection, the present paper-based record leaves much to be desired. Everyone with a white coat, can easily gain access to the records of patients. With regard to data protection, it is obvious that improvements are necessary.

Training and Implementation

Physicians indicate, that new colleagues are able to get used to the patient record reasonably fast. The view of nurses and therapists is not as positive in this regard. They suggest, that a certain amount of time is necessary in order to use the record well. According to the two latter occupational groups, the record especially lacks a user-friendly lay-out. Finally, all occupational groups indicate, that working with the record, should only require a minimal amount of training. Operating the CPR should therefore not require much training effort.

Discussion

Evaluation of Findings

"What are the information needs and demands of physicians, nurses, and therapists, with regard to a CPR?"

This question does not seem answerable with a short sentence. The different occupational groups, which were interviewed with the help of a questionnaire, have each formulated their own points of interests. In any case, it seems that the health service staff has an ambivalent picture of the computer-based patient record. On one hand, it is suggested that the present sticking points in the access of information could be solved with the help of a CPR, on the other hand, the attitude toward computers in general, does not appear very positive.

In general, the opinions of the physicians on the CPR are less positive, than the views of the other groups. Nurses and therapists seem to have a more positive attitude than physicians.

At the time of the survey, both hospitals made use of a large number of paper-based records. The most known are the medical record, and the nursing record. In addition, other record forms are used according to different specialist fields. Radiologists use their own record form and intensive care nurses have their own intensive care records. The findings show, that all occupational groups wish to use a uniform record. The CPR seems a good instrument to promote the uniform use of information. The CPR also prevents, that information is duplicated in different record systems.

Based on the findings, it may be concluded, that the information needs and demands of the health service staff are more efficiently met by a CPR, than a paper-based record. This is suggested, in particular, by the nursing staff. One important omission, is the absence of actual information on medical care and its results, as this is missing in the bulky paper-based record. Nurses on shift-work are largely dependent on the information, entered in the record. A CPR could bring improvements to this area.

Physicians, as well as nurses, indicate, that only a minimal amount of training is necessary, for adequate use of the paper-based record. This should also apply to a CPR and therefore, is an important point of interest. Interest in user-friendly operation and intuitive design is obvious.

Finally, it was notable, that only the nursing staff is interested in a uniform record system for all health care facilities. That other occupational groups attach no interest to this, seems somewhat in contradiction with initiatives, such as transmural medical care and case-management. Both hospitals are involved in these new types of care approaches.

A CPR is an expedient, intended to help achieve an innovation in care. Both hospitals are planning to shortly implement this expedient, in support of the health service staff's primary task. For such an implementation, however, it is necessary to create sufficient support among its users, i.e., the health service staff. A large group among the health service staff, appears to welcome the developments concerning a CPR, with great enthusiasm. A smaller group, namely representing physicians, appears to have a less positive opinion. The support basis, therefore, has a number of weak elements.

Compared to the second hospital, the first hospital indicated more clearly that there was a demand for optimising existing functions and a demand for additional functions. The paper-based patient record received a worse rating in the first hospital, than in the second hospital.

It is interesting to note, that the second hospital is less enthusiastic about the use of a CPR, than the first hospital. This is especially striking in the knowledge, that in many regards, the second hospital has a more innovative policy, than the first hospital. Nevertheless, it appears justified to conclude, that the conditions for developing a CPR in both hospitals, are favourable.

Validity and Reliability of the Measuring Instrument

For the survey in question, a measuring instrument in the form of a questionnaire was developed. At first, the questionnaire seems a reliable instrument. The obtained results, do not differ from those of other surveys, which were undertaken in this field [5, 12, 15]. In this regard, the compiled questionnaire, therefore, seems consistent.

The measuring instrument consists of positively formulated questions. It is possible, that this formulation has encouraged positive responses. To prevent doubts of misrepresentation, the random interchange of positive and negative questions seems appropriate. The disadvantage of this, is the potential of confusion, which results in a lower response rate. From a viewpoint of wanting to maintain response, it does not seem advisable to opt for this interchange.

With regard to the internal validity of the study, the following can be determined: according to the response per occupational group and per medical speciality, it appears that there is sufficient spreading. An inadequate representation of certain departments, has not been established. These findings indicate, that internal validity is plausible.

With reference to the external validity, it seems prudent to conclude, that the scope of the results and conclusions may not simply be extrapolated to other general hospitals. After all, the results of the survey are dependent on a large number of situational factors. At the moment, it therefore does not seem plausible to assume, that the findings would also apply to other hospitals. In order to substantiate the external validity, additional studies are required.

Conclusion

Based on the findings of the survey, a number of conclusions can be made.

Which of the information needs and demands of the health service staff are met by the paper-based patient record?

From an innovative point of view, the paper-based patient record is on its way out. The daily practice of the medical employee, however, portrays a more differentiated picture. Research findings show, that the health service staff still values the old, accustomed paper-based record. Compared to nurses, and therapists, the current paper-based patient record is mostly valued by physicians. Physicians indicate clearly, that the paper-based record is adequate, as far as input- and consulting matters are concerned.

The other occupational groups indicate, that the present record does no longer meet the needs and demands on information.

Which information needs and demands of the health service staff are not met by the paper-based patient record?

The research has uncovered several shortcomings of the record. Firstly, it was indicated by nurses and therapists, that the paper-based record is not adequately protected from unauthorised use. Secondly, it appears that the paper-based record does not provide sufficient information, as far as informing the health service staff of the actual, physical condition of the patient is concerned. Finally, a large number of nurses indicate, that much information is noted down, but never again consulted.

What are the information needs and demands of the health service staff on the CPR?

In the past, the record was primarily a memory aid for individual members of the medical profession. At present, the patient record is considered a form of communication between the health service staff. In this regard, the paper-based record also flunks in the surveyed hospitals. In this aspect, however, the CPR offers many advantages. Additional functions, such as "intelligent" applications, exchange of information with other members of the health service staff and other facilities, therefore are part of the requirements of the medical worker.

Which information needs and demands of the health service staff should be improved in the computer-based patient record, compared to the paper-based record?

When implementing a CPR, one should not only take into consideration the required improvements, but also the properties of the paper-based record, which are satisfactory and should be included in the CPR. The paper-based record has a number of properties which, when incorporated in the CPR, should at least remain at the same level. A few examples of these characteristics are: record availability in all departments, the possibility to leaf through the record, minimal operating training and simple entry of data.

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