

Reviewing the evidence on nursing record systems.

Christine Urquhart¹ and Rosemary Currell²

¹Senior Lecturer, Department of Information Studies, University of Wales Aberystwyth, Llanbadarn Campus, Aberystwyth, SY23 3AS tel. +44 (0)1970 622162, fax +44 (0)1970 622190 cju@aber.ac.uk

² Health Intelligence Manager, Public Health Department, Suffolk West Primary Care Trust, Thingoe House, Cotton Lane, Bury St Edmunds, IP33 1YJ tel. +44 (0)1284 829640, rosemary.currell@suffolkwest-pct.nhs.uk

Abstract

The aim of this paper is to examine the relationship between nursing practice and the recording of practice. Outlines the main findings of a Cochrane systematic review on nursing records, discussing the indications from the included studies that compared computerised nursing care planning with paper-based systems. Qualitative research on nursing records systems, and other survey evidence, is collated to answer questions on the format of the record (structured versus free text, for what type of practice), occasions when information exchange about nursing care may not, and should not be recorded formally, and the effective organisation of the nursing record. Concludes that more research is required to answer these questions, as it seems that computerisation does not always bring the expected benefits, and outcomes for patient care are not clear.

Introduction

A systematic review [1] of the effect of nursing record systems on nursing practice found no evidence of effects on practice attributable to changes in record systems. Although there was a paucity of studies of sufficient methodological rigour for a Cochrane review, to yield reliable results in this area, it is clear from the literature that it is possible to set up randomised trials or other quasi-experimental designs needed to produce evidence for practice. The review identified a need for research into the relationship between clinical practice and its understanding and written expression by nurses.

The main aim of this paper is to examine the evidence from the review, alongside qualitative research evidence to help illuminate the details of that relationship between practice and recording of practice. The implications for evaluation of record systems, including electronic patient record systems are discussed.

Effective nursing record systems may be as diverse as nursing practice itself. One study [2] of unstructured record keeping ('scraps') suggested that the personal records kept in uniform pockets formed an important part of the dynamic record of care, and that the structured formal documentation needs to be related to these scraps, and also the handover process. The challenge for nursing is to understand what characteristics of nursing practice are best served by which characteristics of record systems. For example, which kind of practice needs a structured record, which kind needs to allow mostly free text? What aspects of nursing care need to be recorded and shared electronically, and

which aspects of care are best served by a paper or voice format? A study on medical records systems [3] suggested that the paper and electronic record are complementary for medical records. How will an effective nursing record be recognised? The latter is a fundamental question that cannot be answered until the purposes of record keeping have been fully articulated.

Background: indications from the Cochrane systematic review

A systematic review [1] conducted under the auspices of the EPOC (Effective Practice and Organisation of Care) Cochrane Group, assessed the effects of nursing record systems on nursing practice and patient outcomes, updating the previous version published in 2000. The review encompassed the following types of research design: randomised controlled trials, controlled before and after studies, and interrupted time series comparing one type of nursing record system with another, in hospital, community or primary care settings. Participants were qualified nurses, students or health care assistants working under the direction of a qualified nurse and patients receiving care recorded and/or planned using nursing record systems. The review excluded nurse management systems, such as those designed for rostering or workload measurement only, systems designed for nursing education unless they were applied to real patient care and the ephemeral or informal means of communicating nursing care such as nurses' personal notebooks, ward diaries or verbal communication (such as described in [2]). Studies were included if they gave objective measures of provider performance or patient outcome. The EPOC criteria stipulate that 'satisfaction' questionnaires, for example, need to use validated instruments.

The search found 29 studies that met the inclusion criteria. Of these six were reported as in progress, although no further information has been found about these since the original review. For 15 studies there was insufficient data available about the method or the results and these studies were therefore excluded. Eight studies met all the criteria. Of these, six were randomised controlled trials:

- client-held maternity records (2 studies)
- parent-held child health record
- paediatric pain management sheet
- computerised nursing record systems (2 studies).

The seventh study was a controlled before and after study of a computerised nurse care planning system, and the eighth was a controlled before and after study of two paper nursing record systems.

None of the eight included studies showed evidence of a change in practice that resulted from a change in record system. The client-held records studies suggest some altered and improved relationships between the health professionals and the clients, and the pain management study indicated that better pain control should be obtained with the altered pain charting tool. In the nurse care planning and computerised nursing record studies no differences were found in the quality of care.

The two studies that were new to the updated review both compared paper record systems with computerised nursing record systems. One study [4] compared a paper-based system

with a computerised nursing record system (with a standardised nursing nomenclature), in a long-term care facility. No differences in patient outcomes were found. There was a difference in the recording process, with the computerised system taking considerably longer at first, although the time required for documentation (in both groups) decreased over the study period. There were significant differences between the groups over the number of recorded nursing interventions, and nursing activities. The authors report that the Director of Nursing indicated that the nurses using the paper system did not record all the care provided whereas the nurses using the computerised systems recorded everything. The other study [5] compared the paper-based system with the computerised system in a psychiatric ward in a university teaching hospital, for 60 patients. No patient outcomes were measured but the investigators measured the time spent in care planning, in planning and documentation of tasks, and report writing. Planning and documentation, and report writing took significantly longer with the computerised system but there was no significant difference in the time taken for care planning itself. However, the authors note that comparably few (11 experimental and 6 control) care plans were actually prepared. The quality of the nursing documentation in the two groups was compared by measuring whether the care plans were complete, the average number of problems in a plan, the average number of aims, tasks, the percentage of documentation in which all planned tasks had been executed, and the percentage in which all items were correctly signed, legibility, and overall quality (judged by external nursing experts). The external experts claimed the computerised care plans were often too long, and not sufficiently specific. Only 80% of the planned tasks were carried out with the computerised system, against 100% in the control group. A questionnaire survey of the nurses involved indicated that the nurses agreed that the care plans with the computerised system were more complete, but they thought the quality of the documentation was better too. Opinions from medical staff indicated that three of the five surveyed would be more likely to read the nursing documentation in the computerised system.

Those two studies in the update indicate that the introduction of computerised recording or care planning systems may not lead to time savings, despite this being a claimed benefit of many computerised information systems. The process of care planning can change as well, and there may be some drawbacks as well as some benefits in improved quality of the documentation itself. The other study which compared manual nurse care planning with computerised nurse care planning was a study by Spranzo [6] of four nursing wards, and examined the care planning only (not assessment or progress notes). This study (included in the original Cochrane review) concluded that the effect of computerised nurse care planning had only a negative effect on documented nurse care planning. Care planning had increased on the control wards at the time of the post-test, and Spranzo suggested that there was some compensatory rivalry between the nurses involved. No significant effects on patient outcomes were demonstrated, and there were inverse (but not significant) relationships between the computerised system and nurse attitudes to care planning, and patient satisfaction.

Although around ten years has elapsed between the earlier [6] and later [4] [5] studies, increasing technological sophistication has not, as far as these findings suggest, solved some of the problems of benefits realisation in computerised nursing care planning

systems. The studies are, as the review discusses, limited by the small numbers of nurses and patients included, and it is difficult therefore to generalise. Another problem is the choice of appropriate evaluation criteria. Assumptions are made about the purpose of the nursing record, and these bedevil the choice of evaluation criteria as well as interpretation of the findings. For the Cochrane review, one of the inclusion criteria was that there should be objective measures of professional behaviour or patient outcomes. Comparing 'before' and 'after' on relatively simple criteria may deflect attention from some of the secondary effects that occur in implementing new information systems. Full consideration of these secondary effects, and the process of change demanded a closer look at qualitative research.

Methods

A search was conducted on MEDLINE (1990-2003) using combinations of terms for nursing records (nursing records, medical records (combined with patient participation or professional-patient relations), patient care planning, nursing process) with terms for qualitative research designs (qualitative, action research, ethnographic, semi-structured interviews etc.). Results from these searches complemented search results from the systematic review. Searching for the Cochrane review had already identified some of the qualitative studies as the searching had to be broad in scope. Qualitative research on nursing record systems can be categorised as:

- action research interventions to implement new systems
- ethnographic studies using a variety of methods (for triangulation of findings)
- semi-structured interviews as part of a quasi-experimental design, or controlled trial
- attitude surveys included as part of a quantitative study

All these types of qualitative research studies were included in the review for this paper. For the purely qualitative studies, appraisal followed a similar route to that used for data collection for the Cochrane review. Items retained had to be in scope, and the qualitative studies were appraised using modified CASP criteria [7]: justification of research design, explanation of recruitment strategy and data collection, consideration of researcher bias, ethical issues, demonstration of data analysis, and discussion of the findings and transferability of the results. Several interrupted time series studies failed the Cochrane review criteria, as there were too few time points prior to the implementation of the new system, but they were included in this review if there was relevant evidence for one of the questions on attitude measurement, for example. The emphasis was placed on identifying studies which could help answer the questions set, and the number of databases and resources searched (MEDLINE, Index to Theses, NMAP) limited (due to time constraints).

Results and discussion

The findings are organised under the questions set out in the introduction, as these questions are most likely to be answered by the qualitative evidence. Findings from the quantitative studies included in the review are synthesised, as far as possible, with the qualitative research findings.

Which kind of practice needs a structured record, which kind needs to allow mostly free text?

The evidence from the studies included in the Cochrane systematic review comes mostly from a pain management study [8] and a coronary care flow sheet study [9]. The pain management study indicated that the experimental group children were assessed more frequently, and that the experimental group received more analgesia. The majority of the nurses preferred the new flow sheet (15/24), eight preferred the existing method and one was undecided. In the coronary care flow sheet study, documentation practices improved in both the control and intervention units, although the improvement was greater in the intervention unit. The suggestion, therefore, is that a structured record might assist when prompting is necessary to assure more consistent care. Assessing that an intervention is required and documenting that does not, of course, assure that an appropriate intervention is carried out. Development of a falls risk assessment tool [10] found that the staff found the risk assessment tool and care plan easy to use, but documentation of appropriate interventions was less good in the initial stages of development at least.

Several studies of educational interventions to improve the quality of nursing documentation assume that prompting, in a more structured type of record, will result in better care. Examples include a study in Swedish nursing home wards [11], where individualised nursing care was implemented using the RAI/MDS (Resident Assessment Instrument/Minimum Data Set), together with changes in the organisation of care delivery, using nursing teams. The RAI system also includes Resident Assessment Protocols (RAPs) which specify triggering factors that identify potential problems. Results indicated some changes in care planning, but there were differences between the wards, and the authors note that there was a difference between the computer-triggered RAP items and the manually documented items in nursing care plans. The main change in the documentation (though not in every ward) was an increase in the medical treatment documented.

There are few longitudinal studies of the way records have been developed, although accretion may be the more accurate term. One study [12] describes how, largely at the instigation of one individual physician, a thyroid worksheet system was improved over the years. The primary documents are a printed worksheet and a time-oriented follow-up. For ease of quick scanning and overview, symbols are used. The worksheet allows for free text comments at particular points, though it is 'allowed' anywhere. The follow-up sheets allow for three patient visits on one side of the sheet (6 altogether per sheet). Developments over the years included changes to the coding of the laboratory data, more space for free text entry (later reduced) and inclusion of Bayesian probabilities for physical examination results (later abandoned). A section for the nursing record alongside the physician's record reflected a formal 'sharing of practice'. One interesting point from this study is that improvements to the record were carefully grounded in reflections on practice. The mix of coded and free text entry is one that 'works clinically'. Considerable freedom to develop their own speciality system was, possibly, one of the reasons why this system worked well, as there was clinical ownership.

The question of clinical ownership recurs in many research studies. Allen, in a study [13] of a medical and a surgical ward in one district general hospital in the UK found that nurses felt pressurised to include problems on patient care plans, whether they thought them relevant to the individual patient or not. Documentation was serving managerial aims and helping to avoid problems with litigation, rather than benefiting the nurses in their practice. Other studies [2] [14] also note that formal paperwork was viewed as essential to demonstrate that care had been provided but that formal care planning was not actually practised. In a qualitative study [15] of the use of electronic patient records in maternity services, midwives did not view the provision of 'tick-box' categories as immediately useful to them, although they acknowledged that such structures might be useful for epidemiological research. The tick-box categories were perceived as of more use to medical staff. The midwives continued to use their paper records, despite the duplication involved, as the labour notes, in free text, allowed them to record the details they thought necessary for midwifery practice.

Another advantage of the paper record was that the midwife could make the record, contemporaneously while with the woman. For the midwife, making the record contemporaneously also meant it was more likely to be accurate and detailed. The type of recording task will govern the acceptability of the type of computerised bedside care support offered. Young [16] found that nurses in a large acute hospital preferred a pen-based interface as easier for tasks involving structured data, or structured plus textual data (equally) but for tasks involving mainly textual data the keyboard was easier to use. The keyboard was preferred for accuracy, however, when the data was more structured. One of the design concerns in the PEN&PAD nursing record system [17] was the design of screens that would help nurses navigate around the record and locate the information they required easily. The design concepts were based on features of paper-based records such as a folding list. Care plans could be presented in a tabular format or a discursive format.

Chung [18] interviewed 72 doctors and 101 nurses about fluid balance charting and found that the majority had concerns about the format of the charting, making suggestions to simplify data entry as well as improve its accuracy. Around half of both groups of staff thought that charting was continued beyond its useful duration, suggesting that the purpose of the charting was not clear.

What aspects of nursing care need to be recorded and shared electronically, and which aspects of care are best served by a paper or voice format?

The Cochrane systematic review excluded studies which were only qualitative, but some of the included, quantitative studies did have a qualitative element, however, and these provide some clues on the use of informal communication. An RCT project in Heidelberg [5] also examined user acceptance of computer-based nursing documentation on four wards in a Heidelberg hospital [19]. A pre-test, post-test design was used, with three time measurements. Questionnaires were administered to the nursing staff to assess changes in attitudes to the nursing process, computers in general, computers applied to nursing and the documentation system itself. A qualitative study complemented the quantitative element. Results showed no change, or a slight decrease in acceptance of the nursing process on three wards. A pronounced decrease in acceptance on one ward just after implementation was attributed to a combination of factors (higher than usual workload,

double documentation required initially, and staff less familiar with computers). The findings pointed to the importance of the task and technology fit.

For some tasks, a voice record may be more effective than the paper record. Kerr [20], in a study of handover practice in two paediatric wards (involving observation of 20 handovers) describes various methods of handover (spoken, written and taped) noting that there is little evidence for the advantages of one over the other. His study identified the tension between official and unofficial documentation with care plans being used more as a legal requirement. In some instances nurses preferred the face-to-face handover as this resolved the confidentiality problem. Some information could be spoken, in order to help family-centred care, but recording that information was not ethically desirable. Similar concerns were expressed by 12 school nurses, when interviewed about their concerns in documenting aspects of children's health [21]. Physical health posed no problems but psychosocial aspects were judged more problematic, for ethical reasons (family situation affected this), lack of time, and the structure of the record.

Other tensions noted by Kerr [20] include the need to ensure a comprehensive handover, but avoiding information overload, and satisfying different functions in the handover, where the main purpose (continuity of patient care) can legitimately be supplemented by socialisation and support, or education of novices by experts. An earlier study of handover [14] noted three levels of records. The Kardex and the computerised care plans were the formal legal documents. The ward diary, often containing the same information as the Kardex was viewed as a semi-formal document, shared by ward nursing staff but had no 'legal' status. In addition there were very personal nursing records, the 'scraps' [2] which were kept in nurses' pockets, and kept secure or destroyed as they contained sensitive information. Nurses kept 'scraps' as they felt existing ward documentation was inadequate, and their scraps were more up to date, more convenient, and served as a better reminder for them of the care to be delivered. This raises many questions about which nursing information is integrated into practice, and how.

How will an effective nursing record be recognised?

Comparison of some of the studies reviewed suggests that there are 'between ward' differences in behaviour and attitudes towards computerisation that deserve further consideration. For example, Ammenwerth [19] found that attitudes in one ward were different, there are between-ward differences noted by Hansebo [11], and the finding that documentation could improve on the control as well as the intervention wards suggests that there are interacting organisational factors. The question may be better phrased as 'how many pieces of the jigsaw need to fit together' for an effective nursing record? How does what is there at the start affect the findings?

Some clues are offered by studies which examine interventions which are based on a thorough examination of the baseline situation, and working around this, rather than seeking to change behaviour completely. Pederson [22], in a study of 27 paediatric critical care nurses on one paediatric intensive care unit, explains how the design of a clinical pathway needs to take into consideration not just the evidence but also nurses' existing attitudes to the evidence, and their beliefs, about the effectiveness of drugs in

pain relief. In this case the pathway needed to promote consistency of pain management and this was tackled by a layout which used a narrow range of patient's self reported ratings, and recording before, during and after the procedure for pain management.

Other studies suggest that the prior situation needs to be assessed fully to interpret evaluation findings successfully. One study [23] phrases this in terms of charting compliance: 'sensitivity of system evaluation to the preimplementation charting methods and compliance profile'. These interrupted time series study findings indicated that each nursing unit's charting compliance pattern was different, and that changes in the quality factors (general, assessment, reassessment, education and discharge) varied both across units and across time (pre-intervention, post at 6, 12 and 18 month comparisons).

Mason [24] used participant observation, focus groups and diaries to examine how nursing care plans were used in five clinical areas, all using the Roper model of nursing. Four of the wards did not integrate nursing care plans into practice. The specialist medical ward that did manage to integrate care plans into practice practised primary nursing, the clinical needs of its patients (mainly planned, short stay admissions) required a holistic approach to care, and its care plans were locally owned. Where wards are short-staffed, or much restructuring is going on, implementation of care pathways may be difficult, and documentation poor, as an action research pilot indicated [25]. One study [26] interviewed 15 psychiatric nurses and found that they did not actually use the Roper, Logan & Tierney model for care planning. The lack of effectiveness was attributed to one or more of the following factors: lack of training and support; inadequacy of the model for mental health nursing; lack of fit with the ward nursing philosophy. Nurses were apparently not documenting all the care that was provided, and found the recording of sensitive information difficult (as noted in the previous section).

'Time' or rather a lack of it, is frequently cited as a problem for nurses in using computerised information systems. The two studies included in the update to the review both found that nurses took longer to complete the documentation using the computerised system compared with the control groups using the paper-based system, for some activities at least. Some of the extra time taken might be time taken to familiarise themselves with a new system, and one study [4] found that the time required (for both experimental and control groups) decreased over the study period, as nurses presumably became more familiar with the system and the trial setting. Another [5] found that planning and documentation of tasks, and report writing took significantly longer, but there was no significant difference between the experimental and control groups for care planning.

Qualitative studies confirm that perceptions of the time saving benefits of information system implementations are mixed. One study [27] included an open-ended question in a questionnaire survey of nurses (n=329, response rate 36%) working in a long-term care institution. Responses indicated some dissatisfaction over the time required to complete the documentation, and document review revealed that nurses spent more time making patient assessments, and doing nursing diagnoses than, apparently, evaluating their interventions, or patient outcomes. Another study [28] examined the changes in nursing

practice and attitudes that occurred after implementation of the VIPS nursing documentation system (a problem-based nursing care planning and record system. Focus groups with 20 registered nurses found that positive outcomes for the nurses were the more structured approach to their nursing practice, with more emphasis on nursing expertise. There was some frustration over increased paperwork, aggravated when interruptions, lack of time and workload made completion of the documentation more difficult. Interviews with 12 nurses on an ICU with a computerized nursing care plan system [29] found that their concerns focused on the need to save time, but they also noted possible problems when care planning could not be appropriately individualised. Some of their concerns were carried over from the paper-based documentation system, such as a lack of consensus on nursing diagnoses.

Timmons [30] focused on the reasons why nurses resisted computerised care planning, by refusing to use a new system, or minimising use made of it, or criticising it. Semi-structured interviews with 29 qualified nurses in three district general hospitals revealed that nurses did use the computerised care planning systems, but rather unwillingly (the term resistive compliance was used to describe this behaviour). Creating the care plan was more important than updating it or evaluating it and the latter was difficult when the care plan was not on a bedside terminal. The fear of litigation meant that care planning was completed but more as a retrospective recording of care provided, at the end of the shift. A companion study [31] in a Primary Care Trust, with 22 community nurses found that nurses tended to save the reporting, the inputting of data until the end of the working day. As nurses viewed the task as administrative only, it was not surprising that the computer work might be delegated to non-professionally qualified staff.

Discussion

Several themes recur in the findings considered in the previous section, notably compliance, confidentiality and the fear of litigation. Nurses record information about the care planned or provided because they are obliged to do so, but also because they find they need to record information for their own purposes as well as for organisational purposes. Their own information systems, the ephemeral 'scraps' seem to be organised in idiosyncratic ways. Perhaps it is not surprising that nurses find the design of computerised systems somewhat unfamiliar to their way of working. While substantial amounts of research have been conducted on nursing terminology, and some evaluations conducted (e.g. [32]) there seems less emphasis on the way the format and structure of the formal record can help or hinder nursing practice. The research evidence on structured versus free text entry seems very slim. For nursing and midwifery records, external pressures (such as the fear of litigation) may dominate the direction of preferences. Structured records of the tick box variety are perceived as useful but more for use by other health professionals, possibly. If more detail is required, and accuracy is essential, free text may be perceived as better, and more effective, despite the extra time required (and even the duplication of some information).

Nurses and midwives talk to each other when information needs to be conveyed to other staff, but there might be confidentiality problems in phrasing that information formally on a record for others to view, or even on a dictaphone recording. The most important

information exchange may be ephemeral in the sense that it is not recorded. But what should be recorded, what should be ephemeral? The computerised record, or manual care plan is viewed as the formal record with legal status – but is it a proper reflection of nursing practice and nursing care, given the continuous nature of that care in many situations?

Nursing work may not easily relate to the design of EPR systems. Goorman and Berg [33] note that nurses had problems manipulating the screens to get all the information required, as the EPR assumed a sequence of activities, which did not necessarily match what happened in different wards, and the lack of space for free text also caused problems. Indications from the findings in the systematic review point to the possible dangers of making assessment and care planning too easy to ‘tick box’, as planning might take precedence over monitoring and evaluation of care actually provided. Time savings seem elusive – several studies report that nurses took substantially longer with computerised systems than with the manual system for several (though not necessarily all) recording activities [4] [5] [23] [27]. Other studies [23] [24] found that the outcomes were dependent (though not predictably so) on the situation in the ward or unit prior to implementation.

Some of these evaluation issues could be addressed through better designed trials. For the systematic review many ‘before and after’ studies were excluded as their design did not fit the Cochrane criteria. Several of the included and excluded studies suggest that an interrupted time series design would be appropriate, and this might help to overcome some of the problems in deciding when, after implementation is the most useful time to take measurements. A series of time points before, and after implementation would help to give a fuller picture. It may be necessary to distinguish the different elements of an evaluation hierarchy [34]. If the system is not easy and intuitive to use, then there may be little point in trying to assess the higher levels of evaluation such as changes to work processes or, higher still, the changes to clinical care outcomes.

Conclusions

Further primary and secondary research is required in this area. There is an opportunity to gain greater understanding of nursing practice through an exploration of the information it uses, rather than simply addressing administrative issues (important as these may be). Qualitative research could complement the quantitative evaluation, but the paucity of studies that take this combined approach suggests that organisation and funding of this type of research is difficult. Nevertheless, such research is necessary if money is not to be wasted on implementation of nursing information systems that do not improve the quality of nursing care. The integration of qualitative and quantitative research data attempted in this paper could be extended through a more comprehensive search of the literature, plus development of a more rigorous approach to integrating the quantitative and qualitative evidence.

References

[1] Currell R, Urquhart C. Nursing record systems: effects on nursing practice and health care outcomes. *Cochrane Database of Systematic Reviews* 2003;(3):CD002099.

- [2] Hardey M, Payne S, Coleman P. 'Scraps': hidden nursing information and its influence on the delivery of care. *Journal of Advanced Nursing* 2000;32(1):208-14.
- [3] Stausberg J, Koch D, Ingernerf J, Betzler M. Comparing paper-based with electronic patient records: lessons learned during a study on diagnosis and procedure codes. *Journal of the American Medical Informatics Association* 2003;10(5):470-7.
- [4] Daly JM, Buckwalter K, Maas M. Written and computerized care plans: organizational processes and effect on patient outcomes. *Journal of Gerontological Nursing* 2002;28(9):14-23.
- [5] Ammenwerth E, Eichstädter HR, Pohl U, Rebel S, Ziegler S. A randomized evaluation of a computer-based nursing documentation system. *Methods of Information in Medicine* 2001;40(2):61-8.
- [6] Spranzo L. Effects of computerized nurse careplanning on selected health care effectiveness measures. Unpublished PhD thesis. Maryland: University of Maryland, 1993.
- [7] Public Health Resource Unit. CASP appraisal tool for qualitative research . Milton Keynes Primary Care Trust, Available from <http://www.phru.nhs.uk/casp/qualitat.htm>: Critical Appraisal Skills Programme, 2002.
- [8] Stevens B. Development and testing of a pediatric pain management sheet. *Pediatric Nursing* 1990;16(6):543-8.
- [9] Scharf L. Revising nursing documentation to meet patient outcomes. *Nursing Management* 1997;28(4):38-9.
- [10] Kinn S, Hood K. A falls risk-assessment tool in an elderly care environment. *British Journal of Nursing* 2001;10(7):440-9.
- [11] Hansebo G, Kihlgren M, Ljunggren G. Review of nursing documentation in nursing home wards - changes after intervention for individualized care. *Journal of Advanced Nursing* 1999;29(6):1462-73.
- [12] Nordyke RA, Kulikowski CA. An informatics-based chronic disease practice: case study of a 35-year computer-based longitudinal record system. *Journal of the American Medical Informatics Association* 1998;5:88-103.
- [13] Allen D. Record-keeping and routine nursing practice: the view from the wards. *Journal of Advanced Nursing* 1998;27:1223-30.
- [14] Payne S, Hardey M, Coleman P. Interactions between nurses during handovers in elderly care. *Journal of Advanced Nursing* 2000;32(2):277-85.
- [15] Jones A, Henwood F, Hart A, Gerhardt C. Resistance at the frontline: the case of Electronic Patient Records (EPRs) in maternity services. In: Bryant J, editor. *Current perspectives in healthcare computing 2003 (HC2003)*, Harrogate, 24-26 March 2003`. Swindon: BCS Health Informatics Committee, 2003:48-56.
- [16] Young PM, Leung RM, Ho LM, McGhee SM. An evaluation of the use of hand-held computers for bedside nursing care. *International Journal of Medical Informatics* 2001;62(2-3):189-93.
- [17] Hardiker N. The PEN&PAD nursing record system [Web Page]. 2000; Available at <http://www.cs.man.ac.uk/mig/projects/old/penPad/nursing.html>. (Accessed 2004 Jan 1).
- [18] Chung LH, Chong S, French P. The efficiency of fluid balance charting: an evidence-based management project. *Journal of Nursing Management* 2002;10:103-13.
- [19] Ammenwerth E, Mansmann U, Iller C, Eichstädter R. Factors affecting and affected by user acceptance of computer-based nursing documentation: results of a two-year

- study. *Journal of the American Medical Informatics Association* 2003;10(1):69-84.
- [20] Kerr MP. A qualitative study of shift handover practice and function from a socio-technical perspective. *Journal of Advanced Nursing* 2002;37(2):125-34.
- [21] Clausson E, Petersson K, Berg A. School nurses' view of schoolchildren's health and their attitudes to document it in the school health record - a pilot study. *Scandinavian Journal of Caring Sciences* 2003;17(4):392-8.
- [22] Pederson C, Bjerke T. Pediatric pain management: a research-based clinical pathway. *Dimensions Of Critical Care Nursing* 1999;18(3):42-51.
- [23] Nahm R, Poston I. Measurement of the effects of an integrated, point-of-care computer system on quality of nursing documentation and patient satisfaction. *Computers in Nursing* 2000;18(5):220-9.
- [24] Mason C. Guide to practice or 'load of rubbish'? The influence of care plans on nursing practice in five clinical areas in Northern Ireland. *Journal of Advanced Nursing* 1999;29(2):380-7.
- [25] Jones A. Implementation of hospital care pathways for patients with schizophrenia. *Journal of Nursing Management* 2000;8:215-25.
- [26] Murphy K, Cooney A, Casey D, Connor M, O'Connor J, Dineen B. The Roper, Logan and Tierney (1996) model: perceptions and operationalization of the model in psychiatric nursing within a Health Board in Ireland. *Journal of Advanced Nursing* 2000;31(6):1333-41.
- [27] Martin A, Hinds C, Felix M. Documentation practices of nurses in long-term care. *Journal of Clinical Nursing* 1999;8:345-52.
- [28] Björvell C, Wredling R, Thorell-Ekstrand I. Improving documentation using a nursing model. *Journal of Advanced Nursing* 2003;43(4):402-10.
- [29] Lee TT, Yeh CH, Ho LH. Application of a computerized nursing care plan system in one hospital: experiences of ICU nurses in Taiwan. *Journal of Advanced Nursing* 2002;39(1):61-7.
- [30] Timmons S. Resistance to computerised care planning systems by nurses in the NHS. Anglia Polytechnic University, PhD thesis: 2001.
- [31] Timmons S, Miller S. A comparative study of resistance to nursing computer systems. *ITIN* 2002;14(3):2-7.
- [32] Hardiker NR. Logical ontology for mediating between nursing intervention terminology systems. *Methods of Information in Medicine* 2003;42(3):265-70.
- [33] Goorman E, Berg M. Modelling nursing activities: electronic patient records and their discontents. *Nursing Inquiry* 2000;7(1):3-9.
- [34] Clamp S, Heathfield H, Felton D. From ERDIP to ICRS: lessons learnt from the evaluation of the South Staffordshire EHR project. *British Journal of Healthcare Computing & Information Management* 2003;20(10):31-3.