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Synopsis

Information Systems to facilitate Health and Clinical Management

The papers in this section fall into three categories: Effler et al [1] and Dini et al [2] consider information system-supported mechanisms for improving the delivery of services in the context of a state health department and a county health department respectively. Jones et al [3] and Gustafson et al [4] report on studies of consumer information systems. They examine the effects of providing personalized computer-based information on their problems for specific groups of patients. Ruland [5] and Mönnich and Wetter [6] examine aspects of information system use from the perspective of healthcare personnel by the effects on nursing care and patient outcome of informing nursing staff of patient preferences [5], and by defining criteria for choosing speech recognition software [6] respectively.

A common thread between these papers is that they are all linked to the availability, or planned availability, of computerized records, although some of the principles examined could certainly be applied to manual information systems. Two of the studies [3, 5] follow the sensible approach of creating interim computerized records in order to test planned components of electronic patient records prior to software development.

Notifiable disease reporting is a widely used mechanism for monitoring outbreaks of disease. Depending on the system in use in each environment, either the healthcare personnel who diagnose a notifiable condition or the

laboratories in which a notifiable condition is identified have the responsibility for the actual reporting. Effler et al [1] report on an attempt to improve the effectiveness of notifiable disease reporting from clinical laboratories in the state of Hawaii, USA, by automating the process. In this study, the conventional manual reporting mechanism was compared with an automated reporting procedure which involves the automated extraction of the required data from three computerized laboratory information systems, and electronic transmission of the extracted data files to the reporting authority (the Hawaii Department of Health).

The automated procedure attempts to address two of the major problems associated with notifiable disease reporting: completeness and timeliness. Despite limitations in the automated procedure, the study demonstrated significant improvements in both completeness and timeliness of reporting, and, hence, the potential for greatly improved surveillance of notifiable diseases using automated systems. Problems related to the reliability of the hardware and software and the number of duplicate or incorrect (i.e. reported condition is not notifiable in terms of defined requirements) reports will require technical solutions. A more difficult problem to solve, and one which is encountered in many other circumstances, was the lack of standardized codes and descriptions for laboratory tests and results, and for

diagnoses, in the 3 laboratories participating in the study.

In environments with a significant degree of computerization in clinical laboratories, the results of this study could provide very useful input for decision making about reporting on notifiable diseases by laboratories, and whether some form of automated reporting could be considered. Although communicable disease reporting is a very well-established public health measure, it is worth considering mechanisms for improving such reporting on a continuous basis to ensure effective disease monitoring.

Dini and colleagues [2] addressed another common public health problem: the need to ensure that children are immunized in a timely and complete manner according to a defined immunization schedule. As in the previous study [1], the availability of computerized databases of patient information made it possible to implement automated mechanisms for generating multiple reminders for those caring for children due for immunization during the first 2 years of life. A well-defined randomized controlled trial was used to compare three different interventions with the conventional approach in the environment under review – to issue no reminders of immunizations due or missed. The interventions involved either prerecorded telephone messages, a combination of telephone messages and letters, or letters only. A sample of households which had received tele-

phone messages was also surveyed to assess their response to the messages.

The conclusion of this study was that the computer-generated contacts "are efficacious in increasing immunization coverage of children under 2 years of age". There was no significant difference identified between the effects of the different forms of intervention, and 86% of the households surveyed to obtain responses to the interventions reacted positively. The authors comment that further work will be required to determine the most effective combination of reminder methods and frequency, noting that mailed reminders also enable contact to be made with households not contactable by telephone (10% in this study). They also note that the cost-effectiveness of the interventions was not measured in this study. This factor is very dependent on local conditions, and will be an important factor to be determined locally by anyone else wishing to apply the results of this study. The importance of considering the effects of all possible methods of improving immunization coverage is highlighted by the fact that, even after these aggressive reminders, the best immunization coverage rate achieved in the study population was only 61%.

The two studies by Jones et al [3] and Gustafson et al [4], from Scotland, UK and Wisconsin, USA respectively, examined the effect of the availability of computerized information on health problems for groups of patients in randomized controlled trials. The results of both studies indicate that the availability of computerized information tailored to the needs of patients - either based on the contents of their health records [3] or on their choice of information from a carefully selected set of static information and interactive communication with experts [4] – is of greater benefit to patients than other forms of providing information.

Jones et al [3] provided "personalized computer-based information" to patients undergoing treatment for cancer at a specialist cancer treatment center.

Patients were given access either to general computer-based information on cancer, and/or to computer-based information directly linked to the contents of their medical records. In order to provide access to information linked to individual patient records, the researchers prepared computerized versions of the medical records of patients in the study group and established hyperlinks from the patient records to information relating to specific aspects of the record. Patients had access to the computer-based cancer information during visits to the cancer treatment center, and could print extracts from the available information for reading at home or sharing with others. A third group of patients received information by making selections from available printed booklets.

Despite the careful study design, the discussion by the authors of the study shows that it was difficult to take full account of all the possible variations in patient response to the information made available to them. However, the authors were able to conclude from the results that patients found it more useful to have access to information directly linked to their condition than to have access to general information (either computer based or in printed booklets). Since there was no electronic patient record system available for this study, it was much more expensive to provide the personalized information than to provide more generalized information. However, cost studies done by the authors (not reported in full in the printed paper) indicate that it could be more cost-effective to provide personalized computer based information linked to an electronic patient record than to provide printed information, provided that these requirements have been taken into account in the development of the electronic patient record. The authors also attempted to measure the effect of the availability of information on patient anxiety, but concluded that further study of this important factor is required.

Further insight into the effect of providing patients with computer-based health information is given by Gustafson et al [4], who used an existing consumer health information system (CHESS: comprehensive health enhancement support system) to assess changes in quality of life, health-risk behaviors and use of healthcare services by HIV-positive patients who were given access to the system at home for periods of 3 or 6 months. Patients in the control group did not have access to CHESS. The study was based on the premise that patients who are well-informed can cope better with their illness than those who are not. CHESS aims to provide a range of information services tailored to meet the needs of patients/clients at the time of seeking the information, in a cost-effective way. Services include the ability to interact electronically with healthcare providers and others facing the same health problem.

The results of the study showed that patients benefited markedly from having access to CHESS in their homes in all aspects examined in the study, including reductions in the cost of healthcare service utilization. However, after the system had been removed, only some benefits were maintained, with reductions in benefits more marked for patients in the group who had access to the system for only 3 months than for those in the 6-month group. The authors conclude that the potential savings in healthcare services could pay for providing CHESS to all patients in the study population. They discuss the possibility of providing a Web-based version of CHESS in the future, to facilitate system maintenance and updating, but note that this form of implementation would make it difficult to ensure that patients have access only to high quality information.

The comprehensive literature review included in Ruland's paper [5] indicates that there have been few other studies which attempt to link nursing care practice to patient preferences, although the necessity for healthcare practitioners

to take patient preferences into account when planning care is well recognized. This study measured the effect on nursing care, patient outcomes, and patient satisfaction with treatment of making information on elderly patients' preferences for self-care capability available to nursing staff. The information on patient preferences for the experimental group was provided to nursing staff in the form of a list of patient preferences, ordered by importance to the patient. For one control group of patients, preferences were elicited but not made available to nursing staff, and no preferences were elicited for the second control group of patients.

The results of the study show clearly that the availability of information on patient preferences had an influence on the nurses' care priorities, resulting in significant differences in achievement of patient preferences between the experimental and first control groups of patients. A link was also demonstrated between achievement of preferences and improved patient satisfaction with treatment. Although planned as a forerunner for the inclusion of a patient preference component in an electronic patient record system, the results of this study have potential implications in a wide range of nursing care settings. The author argues that careful elicitation and recording of patient preferences could become a routine component of the nursing care process in future.

One of the difficulties experienced in inpatient healthcare documentation is the timely incorporation of the physician's summary in the patient record. Automated speech recognition (ASR) provides the potential to streamline this process by limiting the typing effort required to complete the summaries. Mönnich and Wetter [6] provide a useful framework for the evaluation of ASR systems by formalizing requirements in terms of nine ASR system characteristics. This classification allows for differences in practice, including the option of report

preparation either by the physician or by a typist.

The authors demonstrate that application of the classification to the selection of ASR systems for two surgical disciplines results in a choice of different systems because of the differing requirements of the disciplines. The implication of this example is that it could be impractical to choose a single standard for ASR systems, especially in a large organization, because a single system may not meet the diverse requirements of users.

The third section of the paper presents the results of a study which measured the effects of implementing the selected systems. In the situation where typing was done by a typist, the ASR demonstrated clear advantages in terms of time required to complete reports from the perspective of the typists, at the expense of a slight increase in physician time required for use of the ASR system, in comparison with conventional dictation. However, in the situation where the physician completed the report rather than it being completed by a typist, there was a significant increase in the time required for use of ASR in comparison with conventional dictation. The paper does not report in detail on the acceptability (or not) of this increased requirement in relation to other potential benefits of using ASR, indicating a need for further investigation.

All the papers in this section provide valuable insights for users of similar information systems in other environments, because they do much more than reporting experiences of individual information system implementations. Most of these studies were designed to examine the effectiveness of health information systems by means of formal comparisons between different implementations. Three of them [2, 3, 4] used randomized controlled trials to compare the effects of different interventions on groups of subjects, and Ruland

[5] divided patients into three similar groups sequentially, in order to compare the effects of interventions. In their study of notifiable disease reporting, Effler et al [1] compared two methods of reporting which were being used in parallel, to assess the effectiveness of a new automated reporting system. Mönnich and Wetter [6] report on a classification framework for requirements for automated speech recognition (ASR) software and report on two cases of using the classification.

References

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