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Original Article:

Development of a Cost-Effective Database Software for Psychiatric Research: A Study From Tertiary Care Teaching Hospital

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Abstract:
Background: Technological progression made drastic changes in health care. Still there is a growing concern about proper utilization of health information within hospitals for various research activities. Huge volumes of such health information in majority of hospitals are redundant due to lack of appropriate and cost-effective technological tools for retrieving relevant health information for research purpose. **Objective**: To develop a cost-effective and user-friendly computerized medical record database for psychiatry using available technology with the department. **Methodology:** Study performed at a tertiary care teaching hospital in Udupi district of South India. Various datasets from psychiatry medical records were utilized for the design and creation of database. A computerized database called PsyCase was developed with the help of technology available within the department. A 4612 patient's data were entered into the PsyCase and subjected to various analyses. **Results:** Applications of PsyCase in various epidemiological studies were explored through performing numerous analyses with actual data. PsyCase was found effective in supporting psychiatric research as well as routine clinical and administrative activities. **Conclusion:** This study emphasizes need of appropriate use of technology available within a healthcare system to facilitate medical research in psychiatry and role of health information professional in such initiatives. Healthcare organization must focus on collective utilization of resources within the system to improve the utilization of health information for medical research.
Key Words: Cost-effective; Database; Epidemiology; Medical records; Psychiatry

Introduction:

Proper maintenance of medical record information and its successful utilization is crucial at all levels of health care management. Even though health care settings maintains Health Information Systems (HIS), there are not many provisions available with majority of the hospital health information system to comprise appropriate indicators to monitor continuity of care of individual patients' as well as to enable medical research. (1) Health Information Management (HIM) professionals need to address various issues in managing health care data in a scientific way.

Information Technology for effective data management functions in a variety of applications including outcomes management, research databases, decision-making and strategy development by using variety of analytic tools and databases.(2) Epidemiology and health information management are two fields that complement each other, validity and reliability of the data managed by health information professionals are essential to the soundness and integrity of epidemiological research.(3) HIM professionals play a significant role in managing health information in any health care setup. In view of the complexity of psychiatric clinical data and the lack of appropriate database management system for psychiatry, innovative research on how effectively technology can exploit psychiatric health care data to enable medical research is highly relevant. Many a time's individual medical departments find it difficult to use HIS available in hospital or market either due to lack of appropriate specialty specific modules in HIS or due to high cost factor. However, in India no scientific attempt has been made so far by HIM professionals and psychiatrists together to develop a customized and computerized database on medical records with available technology to meet requirements of psychiatric research.

Objective

To develop a cost-effective and user-friendly computerized medical records database for psychiatry for easy retrieval of health information, to enhance research and to explore the feasibility of usage of the developed database for understanding the clinical epidemiology of psychiatric disorders.

Methodology:

Study Setting:

Study was conducted at the department of psychiatry in a tertiary care teaching hospital located in Udupi district of Karnataka state. The department of Psychiatry has an average patient strength of 1000 new patients per year. About 75% of

patients' are from Karnataka state and 15% of patients' are from Kerala state.

Data Source:

Department maintains a well-structured medical record for each patient and that formed the data source for the study. A total of 4612 patients' records for five years were utilized for the study. Each psychiatry record includes a psychiatry outpatient detailed evaluation record with other relevant reports according to type of care received by the patient. Entries into psychiatry outpatient detailed evaluation record are made by attending psychiatrist through systematic deliberation and discussion with patient and patient relatives based on standard diagnostic criteria. Patient treatment was planned based on this information along with other investigation reports.

Compare to other medical specialties the psychiatry outpatient detailed evaluation record is exhaustive, it contains patient identification data, provisional, differential and final diagnosis and treatment details, socio-demographic data, patient & informants report, past illness details, family history, personal history, pre-morbid personality details, mental status examination and diagnostic formulation details. Diagnosis is based on International classification for disease coding (ICD) 10^{th} revision classification of mental and behavioral disorders diagnostic criteria for research guidelines. In Psychiatry, diagnosis is arrived based on multi-axial system of classification. Axis – I refers to mental state diagnosis, axis 2 to abnormalities of personality, axis 3 describes physical illnesses contributing to the emotional problems, axis 4 refers to the optimum level of social functioning and axis 5 to stressors.(4) Socio-demographic details includes – Marital status, religion, education, occupation, residence, distance, income source, total family income from all source, family type, family size, head of family & occupation. Past illness contains details about past psychiatric illness, total duration, course of illness and past physical illness. Family history part includes details of consanguinity between patient parents, family tree, family history of mental illness and intrafamilial relationships. Personal history contains details about patient birth and early development, presence of childhood disorders, home atmosphere in childhood and adolescence, scholastic and extra curricular activities, adolescent sexual activity, occupational history, marital history and family of procreation, interpersonal relations and social activity and menstrual history.

Pilot Study:

A pilot study was carried out to identify the relevant datasets to include for the design of database module as well as data collection instruments according to the study objectives. A 100 psychiatry patients' medical record with detailed patient evaluation report was used for this purpose. Each patient medical record and detail evaluation report was thoroughly analyzed for consistency, accuracy and relevance of information documented. Based on the pilot study and further discussion with psychiatrist, pertinent areas in patient detail evaluation report which is relevant for research and clinical evaluation purpose were included for creation of database module.

Development of Database:

Customized, cost effective and user-friendly database software for psychiatry was developed with the help of Ms. Access and Visual Basic (Windows programming language). Visual basic is a powerful programming language used to develop sophisticated windows program very quickly and it is one of the Rapid Application Development (RAD) tools which enable development of application very easily and quickly.(5) During development of this software factors like user-friendliness, different type of epidemiological analysis and flexibility for future modification were considered. This particular software was named as PsyCase.

Various phases in development of PsyCase

PsyCase was developed through various phases. All phases underwent regular systematic validation and efficiency check for prompt generation of desired outcome. Adequate trial run and modifications was carried out before finalization of each component of database based on expert opinion. In first phase different database tables were designed. In second phase various user-Interface structures for the database were developed with Visual Basic 6.0 version as this application was readily available within the facility during development of this software. In third phase, a query module was developed exclusively to facilitate epidemiological research. A follow-up module was designed in fourth phase to update patient's information during follow-up visits without altering any of the previous follow-up visits details. The last phase of PsyCase development was creation of different utilities to generate various formatted reports. The software was specifically designed for use in individual computer systems even without Visual Basic. 6 tools.

PsyCase Validation & Analysis

All 4612 patients' data were entered into the database for validation of PsyCase and analysis of data. Validation of PsyCase software was carried out through two steps. In first step ten different queries were framed and were analyzed manually and as a second step all the same 10 analyses were carried out with PsyCase software. Results of all 10 analysis carried out by both methods were compared for accuracy and consistency. After validation of software, different application of PsyCase in epidemiological research was explored through performing various analyses.

Results:

The objective of the study was to develop a computerized psychiatry patient database to enable various psychiatric research activities, and it was achieved by successful development of PsyCase. It contains 23 User interface modules, one master table and 18 sub tables. PsyCase can be installed in a system with Windows 98 or higher versions as operating system, 500MHz system or higher, 256MB RAM memory, 700MB of free hard drive space and minimum supportive application software

PsyCase Modules

PsyCase contains five main modules. Details and its application are discussed below

Data Entry Module

This module contains five frames. The first frame is 'patient abstract' which contains patient identification, diagnosis, treatment particulars and ICD coding options. The second frame contains 15 fields, which represents socio-demographic aspects of patient. Third frame 'patient report' contains 17 fields which include information such as reliability and adequacy of patient and informants report, stressors, past psychiatric and physical illness, course and duration of illness. The fourth frame 'family history' contains 13 fields which include consanguinity of parents, information about first degree relatives, family history of mental illness and Intrafamilial relationship. The fifth frame 'Patient personal History' contains 18 fields to accommodate information on patient personal history. User can login to the PsyCase with the password according to type of user. Three types of user options are available; they are 'Authorized user', 'Visitor' and 'Data entry'. Authorized user can access all the facility, while some of the facilities are restricted to other users. Through data entry module first visit particulars of patient can be entered in the database. It has been observed that on an average it takes 4-5 minutes to complete the entire data entry of a single medical record into PsyCase.

View record and Edit record are two sub modules available with data entry module. View Record module meets the requirements of viewing the particulars of entire patients' or se-

lected patient data. Through 'Edit Record' facility only authorized user can edit the first visit details of patients based on changes made in actual medical records. All the facilities in this software can be protected with password according to type of user.

Follow-up Module

Psychiatric patient's management and treatment is a long term approach and patients visits clinic for many years for follow-up. So, follow-up details are also very important for research and evaluation of patient and this module of PsyCase meet these requirements. Add follow-up module permits the user to update some of the specified information of patient on each follow-up visit with out altering previous visits or first visit details. View Follow-up option generates outputs in a tabular format, which provides user a quick access to first visit and any number of follow-up details of a particular patient simultaneously.

ICD Module

Maintaining uniformity in entry of diagnosis and its code by various clinicians and data entry persons is very important for the reliability of the database, this module assures that reliability. The main utility of this module is to provide information on various ICD codes based on ICD-10^{th} revision classification of mental and behavioral disorders diagnostic criteria for research guidelines. ICD Code module provides maximum utility through its two sub modules add ICD codes and view ICD codes. Authorized user can update or modify the details in ICD table.

Query Module

From analysis and epidemiological perspective this is one of the important modules in PsyCase. This module was designed in way to give maximum usage of patient information available in the database for epidemiological and other research activities. This facility permits the user to do independent query as well as group query. All fields present in the database are available in a separate selection window for the user's convenience to frame a condition. A condition or query for analysis can be designed by selecting desired fields and its value with appropriate tools available in query window. On execution of query user get a desired output and these results are also automatically stored in an Excel file which can be later used for detailed statistical analysis.

Follow-up analysis module allows the user to analyze the patient first visit and all follow-up details simultaneously. For example if a psychiatrist want to do an analysis, on how many patients' diagnosed with – 'Schizophrenia' in the first visit changed to a new diagnosis 'Paranoid schizophrenia' over a period of five years follow up and contributing factors such as age, occupation etc. To perform the above mentioned analysis by manual methods is difficult and time consuming. With this module such analysis are done quickly. Once an analysis or query is administered, on an average PsyCase take two minutes to generate the result.

Utility Module

This module contains various utilities which can be used for routine administrative and research activities. The search module helps users to locate the patient psychiatry number and brief identification details. It helps to view basic details of the patient during the instance when medical record was not able to retrieve. 'Reports' module generates various types of formatted reports based on information available in the main database table. Nine built-in options are available for generation of formatted reports for any specified period. Through 'Patient specific report' option complete report of a specific patient can be generated. 'Statistics' module enables the user to generate descriptive statistics based on some of the common entities such as state, district, age, religion, marital status etc. There are 12 such options available to derive gender specific descriptive statistics on distribution of mental disorders. This module helps administrators, psychiatrists and policy makers to generate routine statistics quickly and comfortably through formatted reports.

Validation of Software

The important step towards implementation of software package is assessment of its validity. Validity of instrument is, verifying whether it is doing what it is expect to do. The PsyCase package also underwent this testing. Results generated by manual method with the help of Microsoft Access and results generated by PsyCase for all 10 analyses were cross-examined for the accuracy and consistency. Results of all 10 analysis performed by both methods are matching and found to be correct.

The structure and facilities provided in the PsyCase database ensure easy maintenance and retrieval of patient information for various epidemiological studies. PsyCase have many unique facilities compared to many conventional database packages available in market. On evaluating various facilities of PsyCase with the existing database packages available in market such as PsyReport,(6) VitalNet,(7) GPRD etc,(8) PsyCase modules are distinct as it is specifically designed to facilitate epidemiological research exclusively for psychiatry. Many database packages available are vendor made and designed for administrative purposes such as billing or processing of insurance claims. GC's Technologies HIMS software(9) and Medic Aid – windows based patient database developed by AMLA MEDIQUIP,(10) are some of the software available in India. In a study on 'an international review on database use in psychiatry research' conducted by Nicola Higgins and Louise Howard reveals that most studies used essentially administrative databases, containing basic diagnostic, demographic and service use data.(8) The General Practice Research Database (GPRD) in the UK, the world's largest clinical database is sourced from over 400 practices which include mainly patient diagnoses, prescriptions, hospital referrals and treatment outcomes.(8) However, there is no such database available in India exclusively for Psychiatric research. With growing utility of IT in health care, databases become an integral part of medical research, patient's diagnosis, treatment, monitoring and management in medical practice. FilaDB (Filariasis patient information based database), TbDB (Tuberculosis patient information based database), GynSoft (Complete Gynecology patient information based database) ObSoft (Complete Obstetrics patient information based database) PsySoft (Psychiatry patient information based database) are some of the databases developed by Bioinformatics centre of Mahatma Gandhi Institute of Medical Sciences, Sevagram on these context.

Customized and cost effective database which can supports clinicians, administrators, policy makers, epidemiologist and researchers are vital in healthcare. Disease specific database for epidemiological research are rarely found. Psychiatry is an area where we cannot find such comprehensive computerized databases exclusively designed to facilitate epidemiological research based on medical records.

Application of PsyCase

Descriptive studies are usually the first phase of an epidemiological investigation. Through PsyCase various kinds of simple and complex descriptive analyses were performed quickly and easily. Healthcare administrators and policy makers require various statistics on distribution of illness within the community for planning, monitoring and implementation of health care process. Trends in occurrence of disease and changing patterns of disease over a period of time, geographical distribution of illness based on different parameters helps in health care planning and initiation of various health care policies. Distribution of patients' on different geo-

graphic parameters such as district, taluk, place etc is also useful information on this account. PsyCase is successful in generating such type information for general or specific purpose.

Presence of various co-morbid conditions along with the main disorder can affect the prognosis. For example systematic assessment and efficient medication are essential for management of co-morbidity of schizophrenia.(11) With the help of PsyCase software one can generate various baseline information to help such analysis. Many psychiatric disorders are associated with several chronic physical illnesses. Improving the monitoring of physical illness at psychiatry setting is important for prognosis.(12) Through PsyCase software, various co-morbidities (both psychiatric as well as physical) for a main diagnosis or a group of diagnosis can be analyzed. Association of various risk factors or attributes with different co-morbidities can be easily studied with the help of PsyCase.

PsyCase was found effective in generating cases for case control studies. In an example case control study to examine the association of adult personality and behavioral disorders and co-morbidity with gender, age, occupation and residence, a database for cases was generated through PsyCase. For this particular study cases are people with adult personality and behavioral disorders. The results shows Adult personality and behavior disorders were rare disorder among the study population. Among 4612 patients', only 95 patients' (2.06%) diagnosed under this diagnostic category and it was predominant in men (73.6%). A 62.11% of patients' with this disorder were between the age 15 and 29 and students (27.3%) contribute the single largest occupation group. Both rural as well as urban populations had equal representation. Like this one can get a clear picture about the characteristics of cases and it will help in selection of cases. Thus PsyCase helps in quick creation of database for cases.

Another application of PsyCase is in advanced statistics like Discriminant analysis. Discriminant analysis is a statistical technique that examines the set of variables or predictors associated with a given subject and uses similarities and differences to assign the subject to a group or class.(13) Discriminant Analysis identifies those variables that contribute most to the differences between groups. Once data has been periodically entered into PsyCase database it can be used to generate various cross tables. In an example analysis to identify factors or characteristics which discriminate patients' with persistent mood [affective] disorders from patients' with obsessive compulsive disorders carried out with PsyCase shows that gender, age group, martial status , education are statistically significant factors. Further analysis can be carried out to identify various characteristics or risk factors which discriminate one morbid entity from other as well as identifying significant factors contributing to disease process. Maintaining confidentiality of patient information when using medical records for research is always a concern and it is more when medical records are accessed manually. Such confidentiality issues can overcome to a great extend by using computerized medical record database with adequate security features.(14) PsyCase also assure the protection of confidentiality of patient information when medical records are utilized for research.

Conclusions:

This study proved the attempt of developing comprehensive computerized database for psychiatry research with out a cost involvement. Such models of research are very essential to improve the effective management and utilization of abundant health information generated in thousands of hospital and clinics across our country. PsyCase was found very helpful in carrying out various basic epidemiological analysis, clinical studies and routine day-to day activities of psychiatry department. Similar thoughts among various health information professionals and clinicians in various healthcare organizations can drastically reduce burden of hospital or departments on cost of acquiring costly HIS. Appropriate use of technology available within health organizations can enhance research based on medical records and improve the clinical outcomes.

Limitation:

This software was developed on windows based application Visual Basic.6 for individual computer systems according to requirements of psychiatric department. So this software is not compatible with advanced web based application versions like VB.NET. However, based on requirements, with necessary modifications this software can be upgraded to higher versions.

References:

1. Lippeveld T, Bodart C, Sauerborn R. (Editors). Design and implementation of Health Information System. World Health Organization. 2000.
2. Eichenwald SA. The Health Information Management profession. In: Mervat Abdelhark, Sara Grostick, editors. Health Information Management of strategic research. 2nd ed. Saunders; 2001.p.52-5.
3. Watzlaf VJM. Research and epidemiology. In: Abdelhark M, Grostick S (editors). Health Information Management of strategic research. 2nd ed. Saunders; 2001. p.342–65.
4. Casey PR. A guide to psychiatry in primary care. Hempshire(UK): Wrightson Biomedical Publishing Ltd; 1990
5. Pai MV. Computer learning made easy. 1st ed. Karnataka: Bharath Parkashana; 2005. p. 268–368.
6. Mdansby Software, PsychReport patient care management software. Available from http://www.mdansby.com/Software/mdx_page2_Medical-SuitePsy.html. Accessed December 20th, 2005.
7. Expert health data programming Inc. Available from: http://www.ehdp.com/vitalnet. Accessed June 20th, 2006
8. Nicola H, Louise H. Database use in psychiatric research: An international review. *The European Journal of Psychiatry*. 2005;19(1):19-30.
9. G C's Technologies software development house, GC- Health hospital management information system (HIMS). Available from: http://www.gurubrahma-bangalore.com/gchealth.htm. Accessed July 10th, 2006.
10. Amla Mediquip, Software for and by the medical profession. Available from: http://www.amlamed.-com/medicaid.html. Accessed July 12th, 2006.
11. Hirayasu Y. Management of schizophrenia with comorbid conditions. Proceedings of the American psychiatric association 153rd annual meeting; 2000 May 17; Chicago, USA.
12. Beaglehole R, Bonita R, Editors. Basic Epidemiology. Geneva: World Health Organisation. 2002
13. Armitage P, Bessy G. Statistical methods in medical research. 3rd ed. Edinburgh (UK): Blackwell Scientific publication. 1994.
14. Menon GR, Cash R. Research Involving medical records review: an Indian perspective. *Indian J Med Ethics*. 2006 April;3(2):55–7.