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COMPUTER APPLICATION IN DIAGNOSTIC VETERINARY PATHOLOGY

Round table discussion at the 10th autumn meeting of the European society of veterinary pathology, Zurich 24. 9. – 27. 9. 1990

Chairman: G. E. Bestetti

Participants: G. E. Bestetti (Berne)

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COMPUTER APPLICATION IN DIAGNOSTIC VETERINARY PATHOLOGY. POSSIBILITIES AND LIMITATIONS

G. E. Bestetti, Berne

The saving, retrieving, and statistical evaluation of pathological records are essential in modern veterinary pathology, since they allow to study the epidemiology of animal diseases and ascertain their economical impact. Only by means of computers and adequate software the saving, retrieving, and statistical evaluation of pathological reports can be efficiently performed.

The extensive use of computers in diagnostic veterinary pathology institutions, however, has some extrinsic and intrinsic limitations.

Extrinsic limitations are:

- a) hardware and software are different in the different institutions with consequent compatibility problems,
- b) several institutions still do not use computers.

The main reason of the first point is that the diagnostic activity of the various institutions is different, due to the different political and economical environment where they are embed-

ded. Thus the question arises: is it realistic to think of an unified European computer system (hardware and software) for diagnostic veterinary pathology?

As to the *intrinsic limitations*, the first certainly is the approach to a computer-generated report, which is different from the approach to a traditional report. In a computerized system one must avoid saving redundant text, which makes retrieving very difficult if not impossible. Report formulation, therefore, must be synthetic and prolixity avoided. Furthermore, because of their «built in» logic, computers do not make mistakes, provided that both hardware and software are bug-free. Yet, computers normally are not able to correct or tolerate mistakes. Thus, if the reports contain errors, also the retrieved data will be wrong or retrieving will be impossible. As a consequence, although writing time can be reduced by the use of computer-aided diagnostic systems, operators' precision is compulsory.

COMPUTER APPLICATION IN DIAGNOSTIC VETERINARY PATHOLOGY IN BERNE

G. E. Bestetti, G. L. Rossi, Berne

Since 1983 a computer-aided data processing system for diagnostic reports has been developed at the Institute of Veterinary Pathology of the University of Berne.

The hardware currently used are industry-compatible AT-286 microcomputers, operated under the MS-DOS 3.3 operating system. The software are Datastar/Formgen (Micropro, Buffalo, NY, USA) for entering the reports and Supersort (Micropro) for record retrieval and selection. Records generated by Datastar contain comma-delimited fields and can be stored very economically. The cost of every unit is less than \$3000. The concise freetext reports, written on one-side preprinted forms, contain necropsy and histology number, date, patient-,

owner-, and submitting veterinarian identifications, a short description of all pathological changes, 1–5 diagnoses, 6 lines for possible additional remarks, the name of the pathologist, and the taxes. Reports are exclusively entered by secretaries. The whole report is stored, no codification is needed. The retrieving of every item contained in the reports is rapid, inexpensive, and can be performed by every pathologist of the Institute.

From April 1983 till December 1989 34 958 autopsies were performed. The stored reports occupy about 16 megabytes of memory, i. e. about 0.460 kilobytes per report.

The same system, but with different report forms, is used for biopsies.

VETERINARY HOSPITAL INFORMATION SYSTEM, FACULTY OF VETERINARY MEDICINE, UNIVERSITY OF UTRECHT

T. S. G. A. M. van den Ingh, Utrecht

The development of a Veterinary Hospital Information System (VHIS) was imposed upon the faculty by the central administration of the university to get better and faster information about activities, costs and income of the Veterinary Hospital. The VHIS should be a patient oriented, integrated system for clinical and paraclinical departments with primarily a financial administrative function and secondarily possibilities for medical registration. This resulted in an information system for the clinical departments with the following functions: patient identification, registration of visits, hospitalization, treatment and diagnostic procedures, and financial administration. Further, information can be obtained for the management of department and faculty as well as limited medical information. Started 5 years ago in the Small Animal Clinic it has now successfully been implemented in the other clinical departments and the ambulatory clinic. Meanwhile a functional analysis and – design was made for the diagnostic laboratories. After comparison of existing medical laboratory information systems, it was decided to adapt the PHILIPS

laboratory systems MICROS, RADOS and LABOSYS according to the functional analysis and design, and couple this with the already functioning VHIS.

For the pathology department the items to be registered are order/sample registration, clinical history/symptoms and diagnosis, gross findings, histological findings, results from further investigations for instance microbiology, conclusions and diagnosis. Whereas most items will use free text, the diagnosis has to be given according to a standardized index of diagnoses. The latter will be the most difficult task to be performed as most if not all existing systems on standardized nomenclature of diagnoses are insufficient or user unfriendly. Moreover, the information system will produce preliminary and final reports, invoices and various surveys for administration and management and will have possibilities for retrieval of single or combined medical data.

As the VHIS is an integrated system for the Veterinary Hospital, all prior and recent (medical) data on a specific patient will be available at any moment for every department in charge of (material from) the patient.

«4TH DIMENSION» – A POWERFUL DATABASE SYSTEM FOR MACINTOSH COMPUTERS AND ITS USE IN PATHOLOGY

F. Colbatzky, W. Hermanns, Munich

The most important features guiding our choice of a database system were illustrated. The characteristics, which a database software should fulfill, have been: 1. the processing of variable text fields (≤ 32 kb), combined with the possibility to search any terms in such text fields; 2. a flexible report function to produce letter-like and analytical reports; 3. a flexible input control system (e.g. choice lists, filters); 4. the processing of subrecords for multiple indexing by key words; 5. the possi-

bility of handling a hierarchically structured thesaurus; 6. networking/multi user capability; and 7. the availability of a SQL interface. All these features are fulfilled by «4th Dimension». Some peculiar properties of 4th Dimension were explained and demonstrated by examples of our own application, including the overall structure of our database. An example of an input layout was shown and the design and construction of a hierarchically structured thesaurus was discussed.

USE AND LIMIT OF AN INTEGRATED SOFTWARE PACKAGE (LOTUS SYMPHONY® VER. 2.0) FOR DOCUMENTATION IN PATHOLOGY

J. H. Walter, R. Ernst, Berlin

A program consists of the so-called macro-language of Lotus Symphony® is used at the institute of veterinary pathology for documentation as well as for word processing. IBM-clones with 286-Intel-Processors, 640 KB to 1 MB RAM and 24 pin printers are used as hardware.

A user orientated database allows the recording and editing of different data – e. g. signalement. veterinarian, animal

owner, anamnestic data, pathological results and a simple key of diagnosis. The database is connected with a word processor allowing the printing of pathological findings.

The lack of a diagnosis keys like SNOMED/SNOP or ICD-O in human medicine prevents the use of a full computer based pathology system in veterinary medicine. Therefore computers can now only substitute typewriters.

COMPUTER IN DIAGNOSTIC VETERINARY PATHOLOGY

THE USE OF COMPUTER APPLICATION IN DIAGNOSTIC VETERINARY PATHOLOGY

P. Wegmann, Zurich

Since 1987 the services offered by our department are computer assisted. About 4000 necropsies and 3500 biopsies are worked up per year. The cost of the hardware and software to date is about 120 000 sFr. The aim of these acquisitions was to simplify and increase the efficiency of the procedures in the following areas:

- A word processing system to replace the conventional type-written of reports.
- Automatic printouts of quarterly bills for frequent clients.
- Statistical analysis of reports and the selective search of diagnoses.

Four PC stations are connected through a network. The initialisation of each case is done in the necropsy room. There, administrative data, such as owner, submitting veterinarian and particulars of the animal are entered.

The completion of the reports and the final text composition is done by two secretaries at two stations. The 4th station is required for printing out quarterly bills, statistics and processing specialized questions and diagnoses.

The header of a report contains all the administrative data. Since these data are standardized, the electronic processing is without problems.

The second part of the report is a description in text of the findings and the diagnosis. The composition of the text varies according to individual and is thus not necessarily suitable for an electronic system. For this reason the diagnoses are entered once a month according to a standardized code in a final memory. The memories of the dbase-III database contain only the administrative data and the coded diagnoses.

This system has worked very satisfactorily. To date approximately 15 000 reports have been entered. One report requires memory capacity of 0.3 to 0.4 kBytes. Hence we have used up approximately 5 MBytes until now.

The advantage of the system lies in the simplification of the secretarial work and the accessibility of the reports. The system, however, also has disadvantages. The coding must be very precise to allow the retrieval of information. The supervision of the hard- and software and the management of the data is also time consuming.

USE OF DATABASES FOR STATISTICAL EVALUATION OF POST MORTEM AND LABORATORY FINDINGS IN CATS

M. Reinacher, Giessen

We use dBASE III+ on single units of personal computers (AT) to register and investigate FeLV infection in cats. For this purpose two databases were designed.

The first database contains data of cats sent for necropsy in order to provide a diagnosis. At the moment 2382 cats are registered in this database. The main fields in the database are: Month and year of death; age; sex; deterioration/conservation status of the corpses; time elapsed between death and necropsy; results of clinicopathological testing for FeLV infection in vivo by IF-test or ELISA; results of immunohistological testing for FeLV infection post mortem in different organs and tissues; diagnoses mentioned in case history, diagnoses made at necropsy, pathohistological findings and results of microbiological investigations. The diagnoses are entered as code numbers. The code was developed by ourselves. All these fields are statistically investigated for associations between content of any of it with FeLV infection. Programs were written to compute the age of each animal in weeks and to add this value to the database; to extract the frequency of FeLV

infection for different diagnoses and combinations of diagnoses; to transform and export the database as ASCII file to a central computer in order to perform more sophisticated statistical analysis as published (*Reinacher and Theilen (1987): Am. J. Vet. Res. 48, 939–945*).

The second database was constructed primarily for bookkeeping of blood smears sent to our department in order to perform an immunocytological test for persistent FeLV infection (so-called IF-test). It contains at the moment data of 3866 cats. Since the primary intention was to be able to answer phone request about FeLV status of a certain cat as fast as possible the main fields are: Owner and sender of the smear; name of the cat; sex; age; date of receive; date of test; result of IF-test. A program was written to extract the frequency of FeLV infection in general and to establish the relative frequency of FeLV infection in different sexes. This program indicates also the average age of FeLV-positive and FeLV-negative animals in general and of each of the sex groups. Other programs written by us allow for easy and fast investigation of the temporal alterations of the frequency of FeLV infection in the investigated animals.

DATENBANKPROGRAMM MIT TEXTKONSERVEN FÜR DIE HISTOLOGISCHE EINSENDUNGS-DIAGNOSTIK IN DER VETERINÄRPATHOLOGIE

W. Thiel, Detmold

In der veterinärpathologischen Einsendungsdiagnostik ist, wenn man nicht über ein leistungsfähiges Sekretariat verfügen kann, die Anwendung von EDV-Datenbanksystemen mit kombinierter Textverarbeitung unumgänglich. Diese Einsicht führte zur Entwicklung einer D-Base-programmierten Software kompiliert mit Clipper, die auf XT- oder AT-Geräten des IBM-Standards unter MS-DOS mit mindestens 10 MB Festplatte und 640 KB RAM lauffähig ist.

Das Programm integriert in der Auftragsbearbeitung eine Anschriftendatenbank. Auch die Diagnosen, die ebenfalls auf den Rechnungen an Tierbesitzer in erläuterter Kurzform erscheinen, werden in der Datenbank geführt. Zusätzlich sind dem Diagnosefeld drei variable Stichwörter zugeordnet, die der näheren Befundbeschreibung in der Datenbank dienen. Alle Begriffe der Datenbank (ausser den Stichwörtern) sind über Kürzel mit 5 Buchstaben definiert. Werden unzureichend definierte Begriffe eingegeben, kann unter den Begriffen der Datenbanknachbarschaft geblättert werden. Weiterhin sind alle Angaben zu Rasse, Geschlecht, Alter, Material, Einsender, Rg.-Beträge, Rg.-Daten u. a. in der Datenbank vorhanden und auch verknüpfbare Suchbegriffe. Volltextsuche ist nicht möglich.

CONCLUSIVE REMARKS AND FUTURE DIRECTIONS

G. E. Bestetti, Berne

From the presented data the following *conclusions* can be drawn:

- a) huge differences among institutions exist as to the amount and type of diagnostic activity,
- b) several institutions utilize computer systems for applied research projects on spontaneous pathology, only few groups use computer-aided systems for general diagnostic purposes,
- c) very few institutions have a long experience with their computer systems,
- d) the systems used are extremely different from each other as to type, cost, and efficiency,
- e) only in one institution codification of data is not necessary,
- f) only in one case input of diagnostic data is performed exclusively by trained secretaries,
- g) entering the macroscopical data at necropsy and the histology results later on is a binary, time consuming job. Provisional macroscopical data might be misleading for

Die Begriffe Diagnose, Tierart, Material, Geschlecht, Alter und Einsender können im Programm statistisch ausgewertet oder über spezielle Menüpunkte gepflegt oder gelistet werden.

Das Besondere am Programm sind Standardbefunde (Textkonserven) beliebiger Zahl, die in drei Verzeichnissen erstellt und dem jeweiligen Befund angepasst werden können. Hier werden individuell Literatur und eigene Erfahrungen neben Beschreibungsstandards eingebracht und so kann dem Einsender eine aktuelle Epikrise erstellt werden. Auch Bemerkungen zum Einsendungsstatus sind selbstverständlich möglich. Die Textkonserven werden wie die Hilfen über F-Tasten aufgerufen.

Selbstverständlich ist auch die Abrechnung und OP-Verwaltung eingerichtet. Mahnabstände und Rechnungstexte können frei formuliert, Variablen wie z. B. die Mehrwertsteuer können dem aktuellen Stand angepasst werden. Sammelrechnungen gehen nach Anforderung an Tierärzte, wenn die Tierbesitzeradressen nicht vollständig eingegeben werden.

Die Datenbank ermöglicht in der vorliegenden Version die Bearbeitung von bis zu 9999 Befunden pro Jahr. Die Befunde werden in einem eigenen Verzeichnis als Textdateien abgelegt und belasten daher die Datenbank nicht. Dies führt zu einer gleichbleibend hohen Verarbeitungsgeschwindigkeit des Systems und vermeidet extensiven Speicherbedarf.

clinicians who would have access to the pathology data bank,

- h) standardized terminology is not generally used,
- i) standardization and data exchange have an intrinsic limitation: diagnostic pathological reports cannot always be written in English, but local languages must be used,
- j) in case of data exchange, possible legal problems must thoroughly be considered.

Based on these general conclusions the following *future directions* can be envisaged:

- a) the creation and use of an unified European computer-aided system for diagnostic veterinary pathology seems presently to be unrealistic,
- b) institutions must increase their experience in computer-aided systems, which should cover every aspect of the diagnostic activity,
- c) ASCII files might allow a minimum data interchange, whereas the use of the SQL interface should also be considered,

- d) the use of Ethernet cards for intercommunication systems is suggested,
- e) a round table discussion on the same topic should again take place in two years in order to examine the further

development of computer-aided systems in European veterinary pathology.

Last but not least, we must thank Prof. A. Pospischil (Zurich) for the idea and the organization of this table discussion.

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L'Association Suisse pour la Médecine des Petits Animaux ouvre le concours pour l'obtention du prix ASMPA 1991. Celui-ci récompensera des travaux scientifiques orientés vers la pratique de la médecine curative des petits animaux. Sont admis à ce concours aussi bien les candidats suisses que de nationalité étrangère. L'exécution des travaux doit se faire en *Suisse*.

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