Prospects For Computers In Veterinary Field

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In spite of thousands of veterinary text books and journals and hundreds of continuing education meetings, the fundamental mechanism by which the veterinarians attempt to couple the accumulated knowledge of medicine to the individual patient remains unchanged. By and large, veterinarians rely on their unaided memory to forge this link. The existence of a disease, a treatment, or a test must be known and recalled by the veterinarian before it can be applied to the patient. If the veterinarian does not know, or does not remember, the patient may not benefit. Thus, the quality of care depends less on the true scope of veterinary knowledge available to the profession, and more on what fraction of that knowledge happens to be known by an individual practitioner. If the full richness of medical knowledge were readily available to all practitioners, then one important cause of sub-optimal care could be eliminated.

One relies principally on human memory because, until now, there has been no alternative. Of course, merely solving the memory problem will not guarantee optimal diagnosis and management of every case. It is well known that the ability to recall information does not predict the ability to apply it and that the student with the biggest database is not necessarily the best veterinarian. The factors, such as the veterinarian's thoroughness, reliability, and manual skills, also greatly affect the quality of care. These, however, are attributes that can never be computerized and that should be the true focus of veterinary education. Computers will not be able to resolve all the variables that affect the quality of veterinary care. They could, however, largely eliminate errors arising from differences in knowledge.

Errors In Processing Patient Data And Need For Supporting System

Unfortunately, even if all the pertinent information are available, they could not be processed by the unaided mind without error. Errors arise because of human's short-term memory and poor data/information processing capacity. Veterinarians make diagnoses by a hypothetico-deductive process, that is, they set up a number of competing hypotheses that could account for the patient's problem - the differential or rule-out list. Then, by applying what they already know about the patient, or by collecting additional information in the form of further tests or examinations, they attempt to deduce which of the competing hypotheses (diseases) is the most probable.

Veterinarians strive hard to provide optimal care for their patients, but they do not always succeed. Many factors limit their ability to provide optimal care - economic constraints, insufficient knowledge and skills to arrive at a useful inference and possible human errors. To a greater extent, computers can come to their rescue and help them to remove the impediments.

Computers - The Rescue

Computers are an efficient means of storing, analysing and retrieving data, in addition to acting as complex calculators. The invention and subsequent development of silicon microchips has decreased the size and cost of computers and has made them readily available to a wide range of users, including veterinary practitioners. Although the initial reason for a practitioner's acquiring a computer may be as an aid to practice management (For e.g., Pinney, 1981), the machine can also manipulate clinical data very efficiently.

Computers are paradoxical creatures. At once they are powerful and impotent; amazingly brilliant and incredibly stupid; fanatically obedient and terribly demanding. Their behaviour is entirely determined by the interplay between the hardware and the software - the physical assembly of memory, central processor, and input/output devices and the specific instructions encoded in the programs that direct the activities of the machine to perform a specific task.

Computers are becoming an indispensable tool for many aspects of scientific and commercial applications. The veterinarians will

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be pushed back to several decades in scientific development, if they do not use this sophisticated scientific tool. Although veterinary science could offer more potential areas for the use of computers, there were only less actual uses of them in the field. The reasons were:

- Adequate software or programmes had not been available to suit their requirements. Since the veterinary market is a specialised one, in addition to being limited in scope, software producers were not able to justify expenditures to produce specific software.
- Most veterinarians are too busy in their practice to evaluate how a computer can benefit them.
- The monopolistic situation, which the local veterinarian enjoys, makes him not to worry about promoting his business.

Use of computers in Veterinary field

In fact, computer can have application in every area one can mention in veterinary field. Apart from veterinary scientists who would find computers useful in research activities, field veterinarians would be able to use computers for farm management, least cost rationing, feed analysis, disease prevention, disease diagnosis, accounting etc.

Computer-aided diagnosis is an important aspect of veterinary decision support, because diagnosis is usually the first and critical step in patient management, but it is not an end in itself. Complete computer-based veterinary support systems should aid the veterinarian in all areas of medical decision-making, including test selection and interpretation, treatment, management and prevention.

For instance, computers could be used as diagnostic tools in veterinary field, by linking the diagnostic test equipments to the computers for an automatic transfer of results. Once the data are received, the computers could be made to compare the test measurements with the standards established in the program. If the estimated values fall out side the prescribed limits, the program would suggest procedures that should be repeated and additional tests to be conducted. The computer may also run an expert system program to suggest tentative diagnosis based on the abnormal test results.

Computers could also be a boon for hospital administration, case sheet record maintenance, retrieval for follow up action, diagnosis, dispensing medicines, problem solving etc. Computerized clinical records would make it possible to store voluminous data with minute details, and to keep track of performance of patients. Nowadays, almost all the sophisticated equipments are provided with computer facilities. For eg., ECG, EEG, CAT, MRI etc. have all computer support. The use of computers in veterinary science can never be compromised and in future, entire gamut of veterinary science is likely to hinge on computer support. In fact, there is no limit for computer uses especially in the field of veterinary medicine.

Specific areas of application

Data Base Management System: (Dbms)

- Registration of cases
- Classification of cases
- Case history
- Symptoms
- Test results
- Diagnosis
- Treatment and Follow up

Accounting

Statistics

All the above modules will help to manage the situation at ease. The areas mentioned are only indicative and not exhaustive. In a nutshell, the computer may be considered as an essential tool for day today activities and for solving complex problems in the field of veterinary medicine. By effi-

cient use of the system it would be possible to save precious time, cost and energy.

Some software for use in veterinary field

Cardio:

CARDIO (Stevens, 1986) is a program designed to provide diagnostic assistance in interpreting electrocardiographic (ECG) examination of canine and feline patients. It analyses the ECG strip only, not the entire patient, so it does not offer treatment suggestions or prognoses.

Cosreel :

Cosreel (Computer System for Recording Events affecting Economically important Livestock) is an animal health recording system which has been designed for the management of cattle, sheep and pigs (Russel and Rowlands, 983). It can record diagnosis of disease, symptoms, treatment, vaccination, tests and their results. It can also be used for recording management data, veterinary data and production data.

Critter :

CRITTER (Lees et al., 1993) is a computer database program for managing research animals. It is designed especially for institutions which operate health surveillance plans, such as specific pathogen - free schemes. Because CRITTER can be used to record any type of test results in any species of animal, it can be customized to suit any institution. In addition to maintaining a current inventory of each individual animal and its location, the program retains historical information on those that have been removed from the colony. Output summaries are generated by selecting from a menu of standard reports or by designing a custom query. Although CRITTER has been designed for individual research establishments, it could be modified for use in area health surveillance programs.

Episcope:

Modern veterinary epidemiology deals more and more with the identification and quantification of multifactorial diseases, the planning and evaluation of control programs and the assessment of the economic impact of animal diseases. As a result, computer programs which assist in teaching of epidemiology and analysis of data have a valuable role in modern veterinary medicine. EPISCOPE (Frankena et al., 1990) is the computer software used to cover epidemiological principles and calculations. It can assist both the teaching of epidemiology and the analysis of field data. EPISCOPE is based on the spreadsheet program and consists of four modules for evaluation of diagnostic tests, sample size calculations, analysis of cohort and case control studies and models.

Hemo :

HEMO (Stevens, 1986) is a program designed to process a patient's database of laboratory test results and produce a report that provides a diagnostic analysis of these tests for the veterinarian's review and the patient's record. As HEMO is designed to be operated by technicians from raw clinicopathologic test result values, the patient's history, physical condition, symptoms, and concurrent therapy are necessarily excluded from consideration by the program.

Instead of attempting to assimilate all known facts about a case and report the diagnosis, HEMO allows a computer to make calculations and comparisons, report and charactize values outside normal ranges, and match patterns of test results. Further assistance is offered in the form of lists of possible or potential disease conditions that may account for given abnormal test results and lists of additional clinico-pathologic test that may help to interpret present abnormalities and/or support or rule out potential diagnosis.

Virus

Virus (Veterinary Investigation Recording User System) is capable of storing, monitoring and analysing previous and current records (Martin et al., 1982). The results produced by the program are

- stock identtification details such as herd book no., sire and dam details, date of birth, breed etc.
- reproduction details such as calvings, abortions, lactations no., no. and sex of calves etc.
- production data such as milk yield data
- disease events such as type of disease, organisms isolated, type of lesions are etc.
- fertility events such as non-service oestrus, service per insemination, identity of bull, results of pregnancy diagnosis, dry off dates etc.
- death and cull events with reason.

Diagnostic Search Programmes

COWCAD: It contains a database of cattle diseases with all recorded clinical features of each disease.

CONSULTANT: It is similar to COWCAD and in this clinical signs can be entered and the program responds with a list of possible diagnoses

PROVIDES: It is the acronym for Problem Oriented Veterinary Information and Decision Support. When clinical signs are entered, the program generates a list of differential diagnoses in order of probablity, lists of relevant diagnostic tests, treatment options and prognostic probabilities.

Computers In Farm Management For Monitoring Herd Fertility

Regular evaluation of herd fertility becomes essential to ensure profitability of livestock farm business. Evaluation of herd fertility would involve quantification of some reproductive values obtained from records of reproductive events. Obviously, the accuracy of such calculations would depend on the quality and quantity of the information obtained. Some of the measurements of fertility include:

Non-return rate to first insemination- the percentage of animals in a herd not have been presented for repeat insemination within a specified of period of time(But this rate may not be able to provide correct picture of fertility, as non-returns may also result from failure to identify and monitor the animal coming to oestrus)

Calving interval and calving index- Calving interval is the interval in days for an individual cow between successive calvings, while calving index is the mean interval of all the animals in the herd.

Calving to first service

Overall pregnancy rate

The first use of computers as a management tool in diary farming was in milk recording services started in 1950's in the United States. The organizations using computers for herd management came to be collectively known as the Dairy Herd Improvement Association [DHIA]. Most DHI programs now offer, in addition to individual cow production records, somatic cell count[SCC] data, reproductive performance parameters, nutritional information, and management work list, which all could be summarized and reported at the herd level with the use of computers

Through a co-opertive effort with the University of Melbourne, the MELBREAD herd health and fertility reporting scheme was developed by the Veterinary Epidemiology and Economics Research Unit (VEERU), University of Reading, in 1971. Over several years, its use resulted in extensive research and development into a more integrated system that incorporated milk yields, and was known as DANDAIR program. Operational difficulties resulting from use of system on mainframe computer necessitated transferring the program to a mini computer system in 1979. The latter system became known as DAISY(Dairy Information System).

The FAHRMX (Food Animal Health and Resource Management System) computer system was created at the University of Michigan. The objective of this system was to develop a dairy herd monitoring program

to provide a research database and to serve as health management tool. This system differed from the other programs already in existence, in that it made use of the new technology of stand-alone microcomputers placed in local veterinary practice for data input and printing of weekly management work lists. The herd data were transferred by disk to mainframe computer, where the data analysis was performed and the monthly herd analysis reports generated.

These initial computer based herd health programs allowed for the collection and processing of health as well as production data, Various methods have been described for obtaining farm level information. However, they all required the functions of a centrally located computer for the analysis of the data. In essence, they all operated from a remote centralized facility, with their main limitations being the distance of th ecomputer from the source of the data.

Present day programs

The rapid development of microcomputer technology in recent years has led to the introduction of dairy herd management software programs that were no longer dependent on centrally located mainframe computers. Microcomputers increase the efficiency and timeliness of the information that is produced. The need to develop herd monitoring programs, that could be used on various types of stand-alone micro computers, necessitated that softwrwe will be written in a transportable computer language. Recognizing this need, a micro computer version of DAISY was created that allowed it to be used as either an on-farm system or as a system operated from a veterinary practice.

A commercial software called The Dairy Herd Management program (DHMP) was found to be useful tool when implemented as part of a dairy herd health program. Later the program known as Dairy Comp 305, was developed. This dairy software package has been used extensively ason-farm system in California dairies. It differs from the previously described systems, in that it is extremely flexible with repect to its potential for data manipulation and reporting. Infact Dairy Comp 305 is so flexible that it provides few standard reports, leaving definition of output format to user-defined needs. The university of California School of Veterinary Medicine uses a mini computer to keep a database of the information created on-farm allowing for multi-herd analysis for research purposes.

Nowadays, with the help of INTERNET, one can browse can download a large number of herd management programs and experience the demonstration of the software. For eg. INTERHerd, the herd management program developed by INTERAgri and VEERU, UK could be downloaded from www.veeru.reading.ac.uk.com or from the INTERAgri website. Search engines such as Yahoo, Alta Vista etc. could also help to browse and download such software.

Conclusion

The world stands on the threshold of a second computer age. It is only a question of time before ' thinking ' computers open up a whole new range of applications in veterinary field, with the concept of 'Artificial Intelligence' having the potential to change the ways of life of not only human beings, but also animals.

Reference

Frankena, K., J. P Noordhuizen, P Willsberg, P F Van Voorthuysen and J O Goelema (1990), EPISCOPE: Computer Programs in Veterinary Epidemiology, Veterinary Record, 126:573-576

Lees, V W., C. Lukey and R. Orr (1993), CRITTER: A database for managing research animals , canadian veterinary Journal 34:28-32.

Martin, B., D D Mainland and M A Green (1982), VIRUS: A Computer Program for Herd Health and Productivity, Veterinary Record, 110:446-448

Russel, A M and G J Rowlands(1983) COSREEL: Computerised Recording System for Herd Health Information Management, Veterinary Record, 112:189-193

Stevens, F (1986), Special Medical Applications of Computers, Veterinary Clinics of North America: Small Animal Practice, 16(4): 685-702