

General Session

Dr. John Noordsy, Chairman

The Clinical Examination of the Bovine Animal

Eric I. Williams, F.R.C.V.S., M.S.
*Department of Medicine and Surgery,
College of Veterinary Medicine,
Oklahoma State University,
Stillwater, Oklahoma 74074*

The clinician's primary objective in dealing with a sick animal is to make a diagnosis of the ailment as accurately and as soon as possible so that suitable treatment can be initiated.

Accurate diagnosis can only be achieved by a careful and systematic examination of the patient. It cannot be overemphasized that a thorough knowledge of, and the ability to interpret, the *normal* animal will greatly enhance the clinician's ability to recognize the abnormal state. The recognition of clinical symptoms which, under field conditions, are often not present in classical textbook style, can only be accomplished by the astute and patient observation of the sick animal. The ability to translate the recognition of disease symptoms to a positive diagnosis of the ailment also depends on a thorough knowledge of the major features of the disease. A basic understanding of animal behavior is a decided asset.

This paper is a brief review of the methods available to the practicing veterinarian for the examination of the bovine organ systems, with special emphasis on the gastrointestinal tract.

General Considerations

The first essential step is to obtain as complete a history as possible (anamnesis) of the case under consideration. The clinician must guard against exaggeration or possible misinformation by the client.

A clinical examination in the field is usually based on a combination of some or all the following categories: inspection, palpation, percussion, auscultation and paracentesis. The application of these for the individual organ systems is discussed.

The Problem-Oriented Veterinary Medical Record (POVMR) system (described later) is an excellent method of record-keeping which will prove invaluable in the face of a lawsuit and also for student instruction.

The success of a clinician depends greatly on his powers of observation and to be able to interpret the normal and the abnormal (Figure 4) state.

The Digestive System

The bovine gastrointestinal tract is an excellent teaching model.

Before conducting a detailed examination of the digestive system, information on the state of the appetite should be obtained. Equally important is to know whether there is an inability to eat, interference with mastication, the swallowing reflex or an obstruction in the upper digestive tract.

Due to their anatomical and physiological relationships, the rumen and reticulum are regarded as one unit. The clinical interpretation of reticulo-ruminal mobility was documented by Williams (5). By simultaneous auscultation, palpation and percussion over a wide area of the left flank, caudal to an imaginary line from the point of the elbow to the top of the last rib, the clinician should be able to recognize abnormalities such as ruminal impaction, bloat, displacement of the abomasum to the left and possibly torsion of the rumen.

Auscultation over the last three or four ribs along a line drawn from the point of the elbow to the center of the left sublumbar fossa should reveal the classical "tinkling" sounds of a displaced abomasum. Percussion over this area with a percussion hammer or by a flick of the fingers will produce the "pinging" sounds which are typical of the same condition. A sausage-shaped, tympanitic swelling immediately caudal to the left costal arch, together with the "displacement" of the rumen away from the left flank, occur in an advanced case of left abomasal displacement.

Bloat or tympany of the rumen is easily observed at the left flank. Passing a stomach tube or inserting a suitable hypodermic needle or trochar and cannula at the most prominent point in the left flank should determine whether it is a case of simple bloat (large gas pocket) or frothy (foamy) bloat.

Palpation and/or observation of the rumen at the left flank will reveal the state of motility of the fore-stomachs. Astute observation of the flank and the recognition of the eructating and non-eructating con-

tractions of the rumen can be employed in detecting early cases of traumatic reticulo-peritonitis (TRP). In a positive case, a short "stabbing" grunt can be heard during the *non-eructating* contraction of the rumen which is correlated to a contraction of the reticulum.

Percussion or pressure with the "pole test" under the xiphisternum may reproduce a grunt in TRP. By palpating the left flank, a slushy rumen is indicative of vagus indigestion or rumen overload. Always consider the possibility of problems in the lower digestive tract—omasal, abomasal or obstruction of the intestine, in such events.

Ballottement of the lower left flank will reproduce splashing sounds indicative of left abomasal displacement. Likewise, on the lower right flank in a case of right abomasal displacement.

Ballottement over the lower aspect of the 9th to the 11th ribs may elicit a dull pain indicative of omasal impaction. It has been the author's experience that such cases are not commonly found in practice.

Visual inspection of the abdomen will reveal a uni- or bilateral distention (Table 1).

Rectal palpation is an essential part of the examination of the gastrointestinal system. This procedure will assist in the confirmation of bloat, dilatation and/or torsion of the abomasum, and in-

Table 1

<i>Disorder</i>	<i>Abdominal Distention</i>
Bloat	Uni- or bilateral
Vagus indigestion	Unilateral
Rumen overload	Unilateral (bloat), later bilateral with "slushy" rumen
Left displacement of the abomasum	Sausage-shaped tympanitic swelling immediately caudal to left costal arch
Right displacement of the abomasum (dilatation of the abomasum)	Tympanitic swelling, right flank, immediately caudal to the right costal arch
Torsion of the abomasum	
Abomasal impaction	Lopsided appearance, lower right flank, "slushy" rumen
Torsion of the cecum	Distention (usually tympanitic), upper right flank, cranial to tuber coxae
Intestinal obstruction (intussusception, enterolith, torsion of mesentery, etc.)	Bilateral abdominal distention, slushy rumen

testinal obstruction.

Changes in the character of the faeces occur in various gastro-intestinal disorders (Table 2).

During recent years, considerable attention has been given to paracentesis of the abdomen as a diagnostic measure. In cattle, a 6-8 cm 18 gauge needle is introduced, under aseptic conditions, through

Table 2: Disorders of the Bovine GI Tract—Differential Diagnosis

Pain Grunt	Rumen Impaction	Bloat	Change in pH of Rumen	Abdominal Distention	Tenesmus
reticular xiphoid	"doughy"	"slushy"	prim. sec.	unilateral	coccidiosis
inter-costal general	TRP indig.	vagus indig.	frothy	parakeratosis	adv. pregnancy dystocia
acute abdomen	ketosis	diaph. hernia.	simple	displaced abomasum left	twins abortion
early TRP	no water intake	actinobacillosis adhesions		displaced abomasum right	hydropsamnii intestinal obstr.
abom. ulcer		omasal imp. abom. imp.		imp. abomasum	bloat impaction omasum
abom. torsion		obstruction	intestinal	torsion Cecum	diaph. hernia stilbestrol feed
metritis				torsion abom.	actino. reticulum bracken, rabies
ruptured uterus				ventral hernia	vagus indigestion seneciosis
punctured uterus (catheter)					ruptured bladder vaginitis
ruptured vagina					urethral calculi
ruptured bladder					
pyelonephritis (if acute)					
cystitis					
seminal vesiculitis					
change in character of feces		diarrhea (without blood) – colibacillosis, intest. parasites, BVD, salmonellosis, diarrhea (without blood) – rumen overload, terminal cases of chronic venous diarrhea (without blood) – congestion, arsenic			
		diarrhea (fresh blood) – coccidiosis, bracken, sweet clover, winter dysentery			
		diarrhea (dark, tarry, etc.) – intest. obstr., abomasal ulcer, torsion; anthrax, salmonellosis, arsenic			
colic		GI tract—abomasal torsion, intest. obstr., bloat, scrotal hernia (bull)			
		urinary—pyelonephritis, (acute) urinary calculi			
		genital—abortion, torsion of uterus, some cases of dystocia			

the ventral abdominal wall posterior to the xiphisternum and about 3-5 cm to the left of the midline. A sample of peritoneal fluid can be checked for cytologic content, pus, blood, etc.

Exploration of the abdominal cavity can be performed via a laparotomy or a vaginotomy.

The Respiratory System

The principal methods for the examination of the respiratory system are inspection, palpation, percussion and auscultation. The breath should be examined for any abnormal odor.

A general inspection will reveal a nasal discharge, cough, change in the rate and character of respiration, and enlargement of the submandibular and retropharyngeal lymph nodes. A tendency to "fix" the diaphragm occurs in some cases of early traumatic reticuloperitonitis. In extensive, dry, nodular pleurisy, as seen in some cases of tuberculosis, the movements of the lungs are limited.

Enlarged lymph nodes pressing on the pharynx may be seen in malignant lymphoma, chronic shipping fever or tuberculosis. However, "snorting" respiratory sounds are not uncommon in certain beef cattle, with short thick necks. This is not abnormal.

Some clear nasal discharge is usually seen in normal cattle. Purulent material may occur in calf diphtheria, bovine malignant catarrh, rinderpest or infectious bovine rhinotracheitis (IBR). An oral inspection can be made for calf diphtheria, foreign body and pharyngitis.

A physical examination of the chest consists of inspection, palpation, percussion and auscultation.

Palpation in the intercostal spaces may elicit pain, especially in pleuritis.

A triangular area of the chest wall is available for percussion. This area is bordered dorsally by a line from the posterior angle of the scapula to the *tuber coxae*, anteriorly by a line joining the olecranon process of the ulna to the posterior angle of the scapula and caudally by a line connecting the olecranon to the top of the second-last intercostal space. The latter is subject to variation during respiratory movement. Accuracy of percussion is obviously improved in thinner animals. Thickening of the pleura, as in advanced tuberculosis, causes reduction in resonance. Dullness in the lower part of the chest with resonance in the area above is indicative of fluid in the pleural cavity. Large thoracic tumors or lung consolidation cause areas of dullness.

Auscultation with a binaural stethoscope is an essential part of the examination of the chest which should be explored methodically and findings in areas on both sides should be compared. The clinician must be familiar with normal tracheal, bronchial and alveolar sounds in order to be able to detect abnormal sounds. Pinching the trachea will often cause the patient to cough, which is accompanied by an exaggerated inspiration, thus making it easier to detect abnormal sounds such as dry or moist rales.

Paracentesis of the lower chest region can be

employed to obtain a sample of pleural fluid in cases of pulmonary edema or diffuse pleuritis.

During recent years, the fibroptoscope has been used extensively for direct inspection of the respiratory tract.

The Cardiovascular System

Examination of the cardiovascular system involves (a) the pulse, its frequency and character; (b) auscultation of the heart; (c) the venous system; (d) changes in the blood; (e) changes in the visible mucous membranes (conjunctiva, nose, mouth, and vulva).

Some of the main factors to bear in mind are the following:

1. Auscultation of the heart should be made over the lower third of the 4th-6th ribs on the left side.

2. A jugular pulse, *without* jugular distention, is frequently observed in apparently normal bovine animals.

3. Bilateral jugular distention with subsequent edema of the submandibular space and/or the dewlap is seen in the three main cardiovascular disorders in cattle, namely, traumatic pericarditis, bacterial endocarditis or lymphosarcoma of the heart base (Figure 3).

4. Paracentesis of the pericardial sac via the fourth intercostal space slightly anterior to the point of the elbow, using a 6-8 cm 18 gauge needle, will enable the clinician to collect pericardial fluid in a case of traumatic pericarditis. The sample is usually copious, purulent and has an offensive odor (Table 3).

5. Abnormal heart sounds are difficult to detect in cattle unless the clinician has extensive experience. In bacterial endocarditis affecting the right side, the clinical history of previous infection such as metritis, and a shifting lameness should be taken into account in addition to clinical signs of chronic venous passive congestion.

6. In a case of advanced chronic venous passive congestion, a distended liver can be detected by deep palpation of the area immediately caudal to the right costal arch.

Table 3
Cardiovascular Disorders

	Traumatic Pericarditis	Bacterial Endocarditis	Heart-base tumor
Submandibular edema + bilateral jugular extension	+	+	+
		(if affecting left side)	
	+	+	+
100 + /min. pulse	+	+	+
purulent pericardial fluid	+	-	-
splashing sounds on auscultation	+	-	-
	(absent in advanced cases)		

7. A pulse rate exceeding 100/min at rest usually accompanies heart disorders in cattle.

The Nervous System

During recent years disorders of the bovine nervous system have received much attention. The clinician in the field must rely to a large degree on his clinical observation of the patient, together with an interpretation of the available history of the case.

Having spent over a decade in the large animal clinic in this college, the author realizes the importance of a careful general inspection of any bovine animal with suspected nervous disorder. It is a cardinal rule that the possibility of rabies *must* be considered in any bovine animal showing signs of nervous disorder. These may be obvious signs of mental derangement with convulsions or maybe dullness or stupor. However, knuckling of the fetlocks, foaming at the mouth, choking, etc., are also suspicious signs.

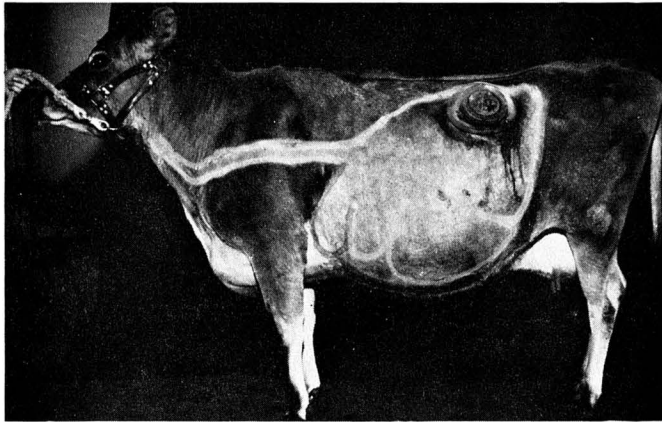


Figure 1. "Luminous Lizzie": This dairy cow has been used by the author as a teaching model whereby the position of the forestomach is outside on the body surface with luminous paint. A rumen plug enables the student to manually explore the reticulo-ruminal sac.

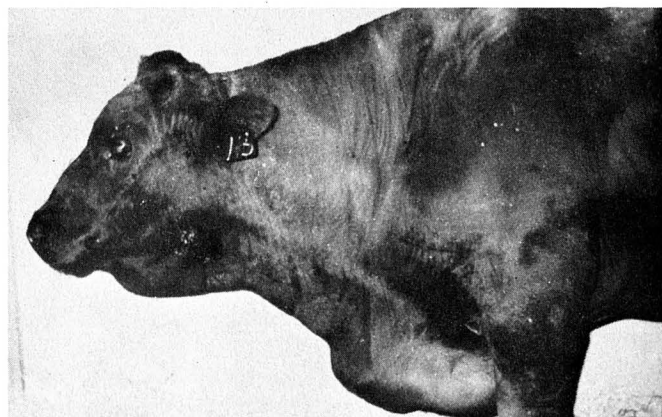


Figure 3. A six-year-old Angus bull with subcutaneous edema of the submandibular space and the dewlap and distention of the jugular vein.

The importance of obtaining a thorough history cannot be overemphasized so that an accurate diagnosis and early treatment can be made. This is particularly important where a group or a herd of bovine animals is involved and when confronted with catastrophes caused by urea, lead, nitrate, cyanide or grain overload.

A knowledge of the pathogenesis of certain nervous disorders is of vital importance in recognizing the disease; for example, the tetanus toxin inhibits the inhibitor centers in the central nervous system, thus allowing a constant "bombardment" of the excitator system, which governs the clinical signs accordingly. Likewise, botulism toxin causes a flaccid paralysis since it affects the release of acetylcholine.

In addition to clinical observation, ophthalmoscopic examination may aid in the diagnosis of certain brain disorders. Changes in the optic fundus and the adjacent retina occurs in meningitis,

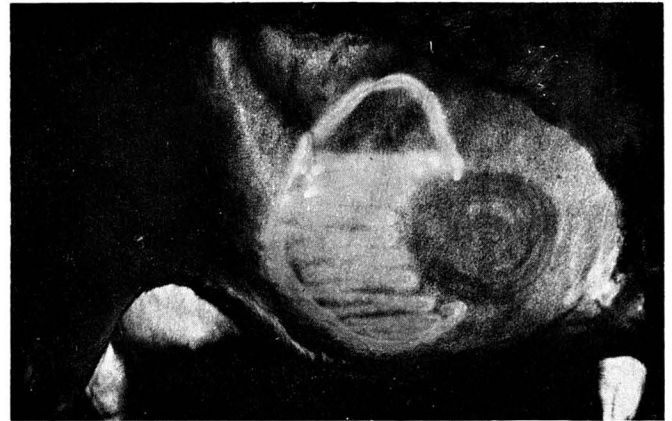


Figure 2. Position of the omasum and an advanced case of right-side distention (displacement) of the abomasum are indicated by luminous paint on the right side of the "teaching model." The distended abomasum can be palpated in the right flank, behind the costal arch (and by rectal examination), also by auscultation and ballottement.



Figure 4. "When the eyes go in, the cow goes out."

encephalitis and abscess formation. Papilledema is associated with vitamin A deficiency, certain brain tumors and hydrocephalus.

A sample of cerebrospinal fluid may be collected by lumbosacral puncture in adults or by cisterna magna puncture in calves. It can be checked for increased cell and protein content (Pandy test). Increased cerebrospinal fluid pressure occurs in vitamin A deficiency and some cases of polioencephalomalacia. Infectious conditions will increase the leucocyte content.

Examination of the peripheral nervous system is based on the specific examination of the areas supplied by the nerves, e.g., radial paralysis; a recumbent animal may have a spinal injury or abscess. Uncoordination of movement is a frequent sign of spinal lymphosarcoma in cattle.

The area supplied by each cranial nerve can be examined to ascertain any disorder that may be present, such as facial paralysis, etc.

The Genital System

The clinical examination of the male and female genital systems involves a general inspection of the animal and subsequent internal examination.

The Female Genital Organs

The clinician can recognize genital disorders by a visual inspection. These include the freemartin, signs of cystic ovaries such as relaxation of the pelvic ligaments, virilism and nymphomania. Examination of the vulva may reveal lacerations, swelling, and maybe signs of uterine and/or vaginal infection.

Manual palpation of the genital organs per rectum is undoubtedly an essential part of the clinical examination. Abnormalities such as ovarian aplasia, segmental aplasia of the mullerian duct (white heifer disease), or uterus unicornis can be detected. Ovarian cysts, salpingitis, mummified fetus *in utero* and pyometra can also be identified.

It is essential that the clinician acquaint himself with the normal genitalia both in the non-pregnant and pregnant state. The ability to detect pregnancy by rectal palpation as early as possible can only be attained by much practice.

Examination of the vagina and cervical region can be made by manual exploration or visual inspection with a vaginoscope.

The Male Genital Organs

General visual inspection, palpation of the external genitalia, rectal palpation and semen collection and evaluation are essential components of a satisfactory examination of the male genital organs. Careful inspection and palpation will reveal a prolapse of the prepuce, hematoma of the penis, an enlarged or atrophied testicle or testicular aplasia. The penis can be extruded and examined following tranquilization or by using a pudendal nerve block. Electroejaculation will serve the same purpose but this method should not be used in determining the possibility of a

deviation of the penis.

By rectal palpation an evaluation of the pelvic genitalia can be made. Abnormalities or infection of the seminal vesicles will be evident. Gentle massage of the ampullae of the vasa deferentia and the seminal vesicles will often produce ejaculation, especially in young bulls.

Collection of a semen sample is usually made by an electroejaculator. The clinician can carry out an evaluation of the sample on the farm. Semen from a bull with an enlarged testicle should be submitted for brucellosis examination.

The Locomotor System

An examination of the locomotor system is obviously related to the examination of the nervous control of the area under consideration.

The examination is mainly focused on the inspection and palpation of the musculature, bones and joints. A comparison between corresponding muscles is indicated in order to establish the presence of local lesions. These can be nervous in origin or due to ankylosis of a joint, etc. A recumbent animal must be examined thoroughly for a fractured bone.

Certain systemic diseases cause obvious lesions in the locomotor system such as the emphysematous lesions in black leg; vitamin E deficiency causes muscular dystrophy in calves; advanced cases of rickets are characterized by deformity of the long bones; swollen joints often follow navel infection. Ankylosis of the spine occurs in dairy bulls which are kept in a stanchion and not given sufficient exercise. Congenital problems include spastic paresis and cerebellar hypoplasia.

An examination of the bovine locomotor system is not complete unless it involves the feet. Whenever an animal is lame it is imperative that the foot of the affected limb be carefully examined for the presence of a foreign body. This important step is frequently overlooked, especially when there are other obvious signs such as infectious pododermatitis.

The location of a lesion affecting the foot is sometimes an indicator of the severity of the condition. On several occasions the author has been presented a bovine animal with a lesion on the antero-medial aspect of the claw. The animal is unable to bear any weight on the affected foot and there is no significant response to antibiotic therapy. In such a case, the clinician's knowledge of the anatomical structures involved indicate that penetration of the corono-pedal joint has occurred due to the close proximity of the joint to the surface at this point.

Summary

This paper is a brief outline of the methods used by the author to examine the various organ systems, with the bovine GI tract being the ideal model for teaching clinical acumen.

The astute clinician possesses the ability to interpret the normal state based on a sound

knowledge of anatomy and physiology, has developed 20/20 clinical vision and is blessed with abundance of common sense. He must take the time to “stand and stare.”

Selected References

1. Blood D. C. and Henderson J. A. (1968). *Veterinary Medicine*, Williams and Wilkins Co., Baltimore. - 2. Fox F. H. (1972). *Diagnostic Techniques for Diseases of Cattle*, J.A.V.M.A., 161, (11) 1251-1255. - 3. Gibbons, W. J. (1966). *Clinical Diagnosis and Diseases of Large Animals*, 1st ed., Lea and Febiger, Philadelphia, Pa. - 4. Kelly W. R. (1967). *Veterinary Clinical Diagnosis*, Bailliere, Tindall and Cassell, London. - 5. Williams E. I. (1955). *Veterinary Record*, 67, 907-922.

Problem-Oriented Veterinary Medical Records (POVMR)

Definition

The POVMR is a method of patient record-keeping that is based on the *problems* exhibited by the patient. All diagnostic and therapeutic procedures are directed toward each individual problem until it has been determined that one or more problems are related.

Purpose

The purpose of POVMR is to provide organized methods for: 1. diagnosis; 2. therapy; and 3. recovery data for future reference and rapid retrieval.

Goal

The goal of POVMR is to improve the quality of patient care.

Procedure

The POVMR will contain: anamnesis and client problem; history and physical examination checklist; data base and progress notes; temporary problem list; client education, and master record. An indepth explanation of the above categories follows:

A. Anamnesis and Client Problem.

B. History and Physical Examination.

C. Data Base and Progress Notes - Findings should be organized according to the instructions and outline on the checklist. In addition, the *Data Base and Progress Sheet* will be used to record all future information as frequently as necessary. Categories are designated as follows: S - Subjective findings; O - Objective findings; A - Assessment; and P - Plan. S - Subjective findings represent opinions. The frequency of examination of the patient is dependent upon how rapidly the problem is changing and the significance of the problem to the patient. The course of clinical signs and the development of new signs (vomiting, diarrhea, depression) should be listed. O - Objective findings are factual data. Routine diagnostic information (temperature, pulse, respiration and laboratory data) should be included. Abnormal diagnostic findings should be noted and recorded under this category. The *Flow Sheet* will facilitate the recording of objective findings and will be discussed later. A - Assessment is based on subjective and objective findings and is the interpretation of the information gathered (patient improving, possible congestive heart failure, justification for therapy). P - Plan is the diagnostic methods and therapeutic regimen for each problem unless the problems overlap. The plan should be divided into diagnostic procedures requested and therapy recommended. The plan will also function as the worksheet for procedures carried out.

D. Temporary Problem List - This list is to be used to develop diagnostic and therapeutic skills and is categorized as follows: 1. Date - Each problem should be dated when first discovered by the clinician. 2. Number - Each problem should be numbered. The same number will be used if the problem recurs. 3. Problem - A problem can be defined as any abnormality that concerns the patient, the owner, or the veterinarian that could significantly affect the patient's well-being. The problem may be identified upon initial examination or revealed by subsequent diagnostic procedures. The most significant problems should be recorded initially. 4. Differential Diagnosis - Each problem should be analyzed as to probable causes. The most probable causes are evaluated first, and the least probable causes are evaluated last. The words,

DAMN IT, are of value when trying to list the underlying causes. D - Degenerative Disorders. A - Anomalies, Autoimmunity. M - Metabolic Disorders. N - Neoplastic Disorders. I - Inflammation, Infectious, Infestation. T - Trauma (external forces, foreign bodies); Toxicity. 5. Diagnostic Procedures - The tests or procedures selected to evaluate each problem, and the rate and frequency with which they are determined, are dependent upon the status of the patient. Laboratory data, radiographic findings, explanatory procedures, and in some instances, response to therapy will be required to accept or reject the various possibilities of each problem, or narrow the differential diagnostic list. Each diagnostic procedure should be numbered with the number corresponding to that problem that is being evaluated. 6. Therapeutic Regimen - Each problem should be evaluated with regard to necessity or desirability of therapy. The therapeutic plan should state the goal. From a diagnostic standpoint, the ideal plan is to withhold therapy until the specific cause or problem has been resolved; however, exceptions have to be made in order to arrest life-threatening signs.

E. Flow Sheet - The purpose of this sheet is to: 1. List all diagnostic procedures, and 2. Follow vital signs and therapeutic regimen.

F. Client Education - Patient-related information should be as complete as possible with detailed explanation of each problem. This information should be documented in all cases if possible, especially in complex problem cases. A written explanation of procedures performed will help provide the client with a realistic idea of the complexity of the patient's problems. In addition, it may help the client realize how much effort, knowledge, time and expense are required to solve the patient's problems.

G. Master Record - This must be placed at the front of the patient's record. It consists of a numbered and titled list of the patient's problem. The master record is added to or changed as new problems are identified or diagnosed and are clarified or resolved. The master record list serves as an index to the remainder of the record. It also gives an individual who is unfamiliar with the case an overall perspective of the patient's problems at a glance.

Summary

The POVMR system is based on principles that have been used in clinical medicine for many years.

The system, however, emphasizes the accurate definition of *all* of the patient's problems and places them in proper perspective. This is a vital step towards solving each problem.

In order to obtain maximum and better-organized information from the data, the clinician is encouraged to list the body systems which are normal and those which are abnormal.

A rigid procedure for the general physical examination of the patient and each system will ensure that the clinician will catalogue the physical findings in an orderly manner. In this age of malpractice suits, the importance of a good record-keeping system cannot be overemphasized.

A diagnostic and therapeutic plan is devised for each problem and is re-evaluated at appropriate intervals, depending on the individual case.

A master problem list is placed at the front of each patient's record. Each problem is numbered and titled. The list includes all present and past problems. The master problem list is invaluable to a clinician who is not familiar with the case to gain an overall perspective of the patient's problems at a glance.

The POVMR is an excellent aid in student instruction in that it requires the recording of clinical information.

References

Books: 1. *Medical Records, Medical Education, and Patient Care*. L. L. Weed. - 2. *The Problem-Oriented System*. J. W. Hurst and H. K. Walker, Editors, MEDCOM Press. - 3. *The Problem-Oriented Private Practice of Medicine*. J. C. Bjorn and H. D. Cross, Modern Hospital Press, Chicago, 1970. - 4. *Scientific Presentation of the 42nd Annual Meeting, Volume II*, American Animal Hospital Association, 1975.

Articles: 1. *Blueprint for Becoming a Master Problem-Solver: The Problem-Oriented Medical Record I and II*, DVM, National Newsmagazine of Veterinary Medicine, Volume 7, February, 1975, Number 3; Volume 7, March, 1975, Number 4. Carl A. Osborne, D.V.M., Ph.D.