



Research Article

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# Method for Creating a MicrosoftExcel-based Consultant Diagnostic Database for Canine Infectious Diseases

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## Abstract

**Objective:** Small animal veterinary specialists and veterinary general practitioners from resource poor settings have a challenge in accessing information on canine diseases that can assist them understand further the differential diagnoses of the diseases. A simple consultant diagnostic searchable database that contains detailed information about specific canine diseases would be cardinal and greatly assist veterinarians in narrowing down and further understanding the differential diagnoses of canine infectious diseases. The objective of this study was to create a method for developing an Microsoft (MS) Excel-based searchable consultant diagnostic database that can be used by veterinarians in resource poor settings to assist in narrowing down the differential diagnoses.

**Methods:** The tool was developed using excel visual basic for applications. In Microsoft excel Visual Basic for Applications, dynamic searchable drop-down combo boxes were created to enable users to key in clinical signs. Codes were written in modules in order to define macros that provided functionality for the "search" button to execute a search for the differential diagnosis.

**Results:** The database contains drop-down combo boxes for inputting clinical signs, a search button and cells for displaying the differential diagnosis. Each canine disease in the database can be summarized in terms of the aetiology, signs and symptoms, diagnosis, prevention, control and treatment. In addition, a list of references and hyperlinks can be provided which the veterinarian can consult for more information on each disease within the database.

**Conclusion:** This database will help in assisting veterinarians to easily access relevant information on the differential diagnosis of canine diseases. The usefulness of this searchable consultant diagnostic data base is discussed in relation to other consultant veterinary diagnostic databases.

## Keywords

Canine diseases; Clinical signs; Diagnosis; Infectious; Visual basic

## Introduction

Animal disease diagnosis involves a number of processes which include history taking, clinical examination and laboratory tests

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where possible [1,2]. One of the central elements in the process of animal disease diagnosis is clinical examination. Clinical examination allows the veterinarian to acquire the information required to identify the disease or diseases causing the clinical abnormalities. A thorough and skillful clinical examination results in an accurate diagnosis which ensures effective treatment, control, prognosis and better welfare for the animal. The success of clinical examination relies heavily on the skills and knowledge of the veterinary clinician [2-5].

Sound knowledge of veterinary clinical diagnosticians should be aided by sound training as well as access to reliable clinical information. Information is considered to be a vital resource alongside land, labor, capital and skills [6]. Veterinarians need information for enhancing their diagnostic skills and for further understanding of animal diseases.

Field veterinarians in resource poor settings usually have a challenge in accessing libraries and other sources of information such as text books and the internet. The veterinarian in resource-poor settings almost always rely entirely on information obtained from the patient's history and clinical examination to arrive at their differential diagnoses. Lack of specialized diagnostic equipment means that veterinarians in resource-poor settings do not have the luxury of the various veterinary medical tests such as clinical chemistry, fluid analysis, hematology, histology, microbiology, serology and toxicology [7-9]. In addition, the veterinarians do not have access to textbooks and the internet to assist them to further understand and narrow down their differential diagnoses. As such the chances of misdiagnosing animal diseases are high.

A simple consultant diagnostic database that contains information about specific canine diseases would be cardinal and greatly assist veterinarians in narrowing down and further understanding the differential diagnoses of canine infectious diseases.

A number of veterinary consultant databases and informatics have been created for veterinarians before [10-12]. These consultant databases have been very valuable and useful. However, these databases are usually inaccessible to most veterinarians in resource poor settings where internet facilities are poor or unavailable. The desirable attributes of a computer-based diagnostic aid should include ease of use, ready accessibility, sound reasoning, completeness, the ability to justify its recommendations and a system for updating [12].

In this paper, I have proposed and provided the process for creating an MS excel-based diagnostic consultant tool that can be used mainly by veterinarians in resource poor settings to aid in the diagnosis process.

## Materials and Methods

### Protocol for creating combo boxes with drop down lists.

Most of the steps for creating and operationalizing the drop down combo boxes were accessed from the **Developer** tab on MS excel ribbon. The Developer tab is usually not available on the excel ribbon but it can easily be accessed as follows:

File > Options > Customize Ribbon. In the Main tabs list, the Developer box can be checked followed by clicking OK.

1. Click **Developer > Insert**
  - a. Under From Controls, click list box (Form Control)
  - b. Select the cell where the combo box will appear
2. Click **Properties > Control**
  - a. In the Input range box, the range of cells from the clinical signs list was typed.
  - b. In the **Cell link** box, a cell reference for the combo box was typed.

#### Creating the “SEARCH” button

In order to create and operationalize the “SEARCH” button, the MS excel visual basic for applications (VBA) was used [13-15]. In addition, standard excel formatting procedures were used to create the structure of thesearch button. The “developer” tab was selected from the MS Excel ribbon in order to access the VBAtool. MS excel VBA coding standard for writing macros was used to define the macros for the search button. In the VBA, a module (code window) was opened and the codes written for the search combo boxes and search button.

A number of MS Excel functions were used to create the searchable list and drop-down combo boxes [16-18]. The functions used were:

1. SEARCH Function
2. ISNUMBER
3. IF Function
4. MAX
5. ROWS

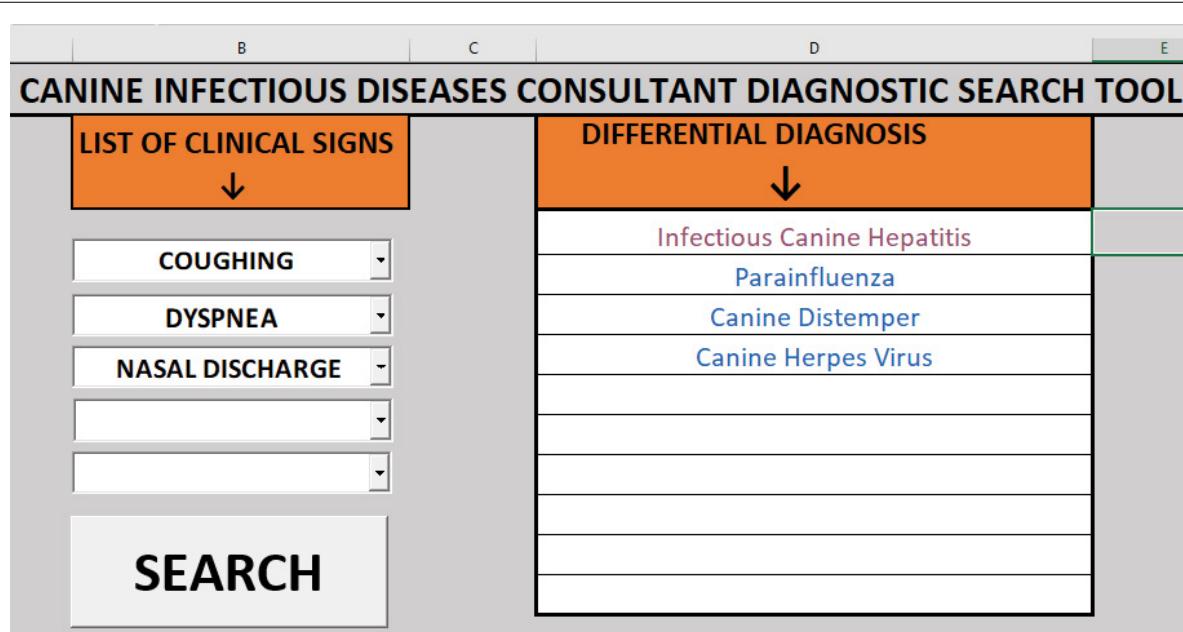
6. VLOOKUP
7. IFERROR
8. COUNTIF
9. OFFSET Function
10. FILTER

#### Results

The consultant diagnostic searchable dataset consists of three parts. The first part, is a worksheet that consists of a list of clinical signs and their associated infectious diseases. The second part is a worksheet named “SEARCH” (Figure 1) which consists of five dynamic drop-down combo boxes for keying in the clinical signs as determined by the veterinary clinician. The third part of the database consists of a number of worksheets each containing details about each infectious disease. Each of the worksheets contains details about each disease depicted under the following headings: description, etiology, transmission, clinical signs, diagnosis, prevention, treatment, references (Figure 2). The 35 worksheets and the CINICAL SIGNS worksheets are hidden from the user who only views the SEARCH worksheet.

#### How the consultant diagnostic searchable database works

In this consultant database the clinician types in the clinical signs within the SEARCH worksheet. The drop-down combo boxes display the available clinical signs within the database according to the key words being typed in. Clicking the “SEARCH” button executes a macro (code) that instructs MS-excel to search for the keyed in clinical signs in the database and to display the differential diagnosis associated with those clinical signs. The differential diagnoses are displayed in hyperlinks so that when each is clicked, the user is taken



**Figure 1:** Snapshot example of the “SEARCH” worksheet showing a list of clinical signs in drop down combo boxes, the SEARCH button and the output slot for the DIFFERENTIAL DIAGNOSIS. The user inputs (types in) the clinical signs in the drop down combo boxes and clicks on the “SEARCH” button. The results of the search are displayed under the DIFFERENTIAL DIAGNOSIS as a list of possible diseases matching the clinical signs. The differential diagnoses appear as hyperlinks which can be clicked to take the user to the worksheet that contains details on that disease.

DISEASE	DESCRIPTION	AETIOLOGY	TRANSMISSION
<b>CANINE DISTEMPER</b>	Canine distemper is a viral disease that affects a dog's respiratory, gastrointestinal and central nervous systems, as well as the conjunctival membranes of the eye.	Canine distemper is caused by a single-stranded RNA virus of the family Paramyxoviridae (the same family of the viruses that causes measles, mumps, and bronchiolitis in humans). The disease is highly contagious via inhalation.	Exposure to the virus is generally by aerosol contact with epithelium of the upper respiratory tract, with multiplication in tissue macrophages and spread by lymphatics to tonsil, retropharyngeal and bronchial lymph nodes. By 4-6 days post infection, virus replication occurs in lymphoid follicles of the spleen, lamina propria of the stomach and intestines, mesenteric lymph nodes, and Kupffer cells of the liver. At this time there is fever and leukopenia. 8-9 days post infection there is hematogenous lymphocyte associated viremia with spread of virus to epithelial and central nervous system tissues with shedding of virus from all body excretions even in dogs with subclinical infection

Figure 2: Snapshot example of the differential diagnoses, in this case canine distemper. The worksheet contains details about the disease in terms of description, aetiology, transmission, clinical signs, diagnosis and treatment.

to another worksheet that contains detailed information on that particular disease. The steps involved in searching this database are as follows:

1. The user (veterinary clinician) after a thorough clinical investigation comes up with a list of clinical signs.
2. The veterinarian then opens the excel database from the desktop which displays the search worksheet.
3. In the search worksheet, the user enters the appropriate clinical signs of the patient in the drop down combo boxes and then clicks on "SEARCH" button.
4. A list of all possible clinical signs for the clinical signs is displayed under the DIFFERENTIAL DIAGNOSIS list.
5. The veterinarian can then click on any of the list of the differential diagnoses that appear as hyperlinks.
6. After clicking on the hyperlink in the DIFFERENTIAL DIAGNOSIS list, the user is taken to another worksheet which contains more information about the selected disease.

## Discussion

Whether in animals or humans, getting the right diagnosis is a key aspect of health care [19]. In veterinary medicine, the diagnosis process is not very different from that in human medicine except the veterinarian usually deals with animals that cannot explain their symptoms. The diagnosis process is a complex, patient centered collaborative activity that involves information gathering and clinical reasoning with the goal of determining a patient's health problem. It is a cyclical process of information gathering, information integration and interpretation. During the diagnosis process the clinician may refer or consult with other clinicians as part of the process of accumulating information that may be relevant to understanding a patient's health problem. After information gathering, integration and interpretation, a hypothesis about the disease is generated that may lead to the development of a list of the likely causes of the disorder or what is known as the differential diagnosis [19,20].

A consultant diagnostic database can act as an adjunct to the diagnosis process. It has the potential to impact the diagnostic process in both positive and negative ways. When health IT tools support diagnostic team members and tasks in the diagnostic process and reflect human-centered design principles, health IT has the potential to improve diagnosis and reduce diagnostic errors [21].

Desirable attributes of a computer-based diagnostic aid should include: ease of use, ready accessibility, sound reasoning, completeness, the ability to justify its recommendations and a system for updating.

The proposed MS excel database has many similarities to the internet based veterinary consultant diagnostic database [21] but there are a few differences too. The main difference is that this database will not require internet connectivity. In addition, the database is only focused on information on canine diseases as compared to the internet based databases that contain information on a number of animal species e.g. seven animal species in the case of [21].

The MS excel consultant diagnostic database will be relatively easy to use. Most veterinarians have a working knowledge of MS excel. Only a few steps will be required for the veterinarian to accomplish the task of searching the database.

Comparatively, this database will have more information on specific canine diseases as compared to the information found in the internet based databases. Most of the internet databases display only a few aspects of the differential diagnoses such as description, signs and references usually on a wide range of animal species. In this database, information is focused only on different aspects of canine diseases that include description, etiology, transmission, clinical signs, diagnosis, prevention and a list of relevant references.

In this database, information is provided about the general characteristics of each disease under the heading of "description". Each disease is defined and its general characteristics provided in order for the veterinarian to quickly assess if the disease should be part of their differential diagnosis [22,23].

The biology, including the epidemiological distribution of the pathogens responsible for causing each of the diseases, are described in detail under the heading "etiology". Other aspects of the diseases

included in this database are the transmission, clinical signs, diagnosis, prevention and treatment thus giving the veterinary clinician a wider perspective on the disease.

By using this database as a consultant diagnostic tool, veterinarians in resource poor settings can quickly refine their differential diagnoses. In addition, this database can also be used by researchers in small animal medicine to gather background information on canine diseases.

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### Conflict of Interest

The author declares that there is no conflict of interest.

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