Proper positioning is critical. Use of anesthesia and/or restraint boards will reduce the human exposure to radiation but may pose increased risks to the compromised patient. These risks should be assessed prior to obtaining radiographs.

For a ventro-dorsal radiograph, proper positioning will be reflected by alignment (superimposition) of the vertebral column and the carina of the keel. To thoroughly examine lateral aspects of the cranial and mid-coelom, the wings should be extended symmetrically. The acetabula and scapulae should be symmetrical.

In positioning for the lateral position, the carina of the keel should be parallel to the table. On viewing the radiographs, the acetabula, scapulae and coracoids should be superimposed.

Digital radiography has made communication between practitioners, referring veterinarians and radiologists much more efficient. The image detail with digital radiology is not as great as with some available films but there is increased image contrast and ability to manipulate the image. However, with some structures in smaller birds, the greater detail inherent in mammography and dental films still has advantages.

Identifying normal structures on avian radiographs is the first step toward utilizing these for diagnosis of illness or injury. A list of structures that will be identified in radiographs and in line drawings during the Power Point presentation follows. Some bullet points regarding these structures are included below:

**Skeletal**

1. Head/skull  
   a. Scleral ossicles of the orbit  
   b. Jugal bone  
2. Hyoid apparatus  
   Shoulder girdle  
   a. Coracoids  
      i. (Commonly fractured in free-ranging raptors)  
   b. Clavicles – In psittacines these are not fused into a furcula  
   c. Scapulae  
   d. Sternum (keel)  
   e. Carina of the keel  
3. Thoracic limb  
   a. Humerus  
   b. Radius/ulna  
   c. Radial and ulnar carpal bones  
   d. Digits  
      i. Alular (I) or bastard wing  
      ii. Major (II)  
      iii. Minor (III)  
4. Vertebras  
   a. Cervical (ribs present)  
   b. (Fused notarium present in some species)  
   c. Thoracic (ribs present)  
   d. (Synsacrum)  
   e. Free caudal vertebrae  
5. Pygostyle (fused caudal vertebrae)  
   Pelvic Limb  
   a. Femurs  
   b. Tibiotarsi  
   c. Tarsometatarsi  
   d. Digits (numbered one through four in psittacines - each containing one more phalange than the digit number)

**Cardiovascular**

6. Heart and great vessels including the aorta  
   a. Average measurement parameters
Respiratory

7. Trachea
8. Syrinx
   a. difficult to visualize – usually between 2\textsuperscript{nd} and 3\textsuperscript{rd} thoracic vertebrae
9. Lungs
   a. honeycomb pattern and location
10. Air sacs (borders of ii-iv below only visible if abnormal)
   i. cervicocephalic
   ii. clavicular
   iii. cranial thoracic
   iv. caudal thoracic
   v. abdominal

Gastrointestinal

11. Ingluvies (crop) (in species where present)
12. Esophagus
13. Proventriculus
14. Isthmus
15. Ventriculus
16. Intestines
17. Cloaca

Other organs

18. Liver (note cardio-hepatic waist and species variation)
19. Spleen
20. Uropygial gland (when present)
21. Note: Pancreas is not radiographically visible but is present in the duodenal loop

Species /gender differences

22. Macaw and some cockatoos - smaller liver
23. Ducks and geese
   a. Syringleal bulla in males
   b. Reduced cardio-hepatic waist
24. Penguins bifurcated trachea
25. Trumpeter swan redundant trachea
26. Testicles
27. Ovaries
28. Pneumatic bones (with species variation)
29. Hyperostotic polyostosis (estrogen stimulation in females)

Thanks to Dr. Jon Rubinstein for use of material from his presentation at the Florida Veterinary Medical Association Conference, 2009 and to Dr. Greg Harrison and Dr. Majorie C. MCMillan for the incredible radiographic examples provided in her chapter “Imaging Techniques” in Avian Medicine, Principles and Application, currently available through Iowa State University Extension.

References/recommended reading