The International Skeletal Society: A Potential Model for Radiology and Pathology Collaboration

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Artificial Intelligence's (AI) most valuable impact on medicine will be its ability to integrate vast amounts of clinical, diagnostic and prognostic information (ie, information management) in managing patient care (1). This will be especially true in the context of personalized health care, in which management and outcomes are optimized based on unique diagnostic biomarkers and characteristics of an individual patient and associated condition(s). The two specialties that have been suggested to be the greatest affected by AI are radiology and pathology (1).

At their essence, the fields of radiology and pathology both involve interpretation of medical "images", obtained in-vivo or ex-vivo respectively, for assessment of anatomy as well as direct or indirect biomarkers of health or disease. Traditionally, information or "data" extracted from medical diagnostic testing by radiology and pathology has been managed independently with results transmitted to a referring clinician for integration into a particular patient context (2). Recently, a pilot program to develop an integrated radiology pathology report has been developed to help referring physicians mange discordant pathology and radiology results (3). The evolution of new technologies, and the vast amounts of resultant complex diagnostic testing data has led to challenges for health care systems and care providers in cost-effective and appropriate utilization of diagnostic resources as well as challenges in effectively integrating and maximizing the yield of diagnostic data toward improved outcomes for populations and individual patients. AI has the potential to efficiently store and analyze these large amounts of data. However it will still rely on physicians to interpret these results in the context of each individual patient and communicate this information to other physicians as well as patients themselves. The similarity of radiologists and pathologists as "image interpreters" and the potential significant disruption on both fields by AI has led some to advocate for the merger of these two specialties into the field of "information specialists" (4).

Although not unified into a single specialty, the benefits and importance of an integrated multi-disciplinary clinical diagnostic approach to the interpretation of radiologic and pathologic results has long been a fundamental tenant in optimal diagnostic assessment and clinical management of various musculoskeletal (MSK) conditions including primary bone and soft tissue tumors. Biologically distinct types of bone tumors may have overlapping histologic features and the integration of clinical, radiologic and pathologic assessments are critical in the accurate diagnosis of bone tumors (4,5,6). It was with recognition of the importance of radiologic-pathologic correlative care, that the International Skeletal Society was formed in 1972, as a multi-disciplinary Society. The goal of the society is to bring together subspecialized musculoskeletal radiologists and pathologists dedicated to the understanding, diagnosis and therapy of musculoskeletal disorders, to learn from one another in aims of improving the care of MSK disorders. Today the Society has a membership of 566, composed primarily of subspecialist MSK radiologists and pathologists with a small number of orthopedic surgeons and rhuematologists. The society's annual meeting allows radiologists and pathologists to present and discuss difficult cases and new developments in both radiology and pathology in an integrated fashion ensuring optimal patient care.

While in the 1970's, the correlation of radiologic-pathologic diagnostic results was primarily limited to correlation of clinical, conventional radiographic, macroscopic and microscopic findings, modern diagnostic investigations in patients with MSK disorders may include MRI, CT, PET, radiomics, molecular diagnostics, proteomics and genomics (eg, next generation sequencing).

The vast amount of radiologic, pathologic and genomic data available through modern diagnostic testing provides

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tremendous opportunity for data driven clinical decision-making and population health strategies. Future innovations and developments in AI and machine learning provide opportunities for image data collection and integration from across numerous data sources, well beyond limits of human cognition. Such anticipated technological and data analytic innovations enabled by the evolving field of AI will ultimately provide the opportunity for personalized outcome-data driven healthcare decision-making, placing diagnostics at the central point of patient management.

It is in this context that opportunities of integrated radiology-pathology information specialists and diagnostic medicine services are envisioned (1,7-9). The prospect of effective integration of clinical, radiologic, histopathologic and genomic data through AI and machine learning provide important opportunities for diagnostic specialties in future healthcare value chain leadership, rationale for strategic integrated investments in diagnostic IT resources, and transformative changes in personalized and system health care delivery.

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