OR29-02: Natural Language Processing of Radiology Reports Improves Identification of Patients with Fracture

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Fracture liaison services (FLS) address the treatment gap for those with osteoporosis (OP) who fracture and are not treated. Given the limited human resources in FLS, screening high volumes of radiology reports for fractures with Natural Language Processing (NLP) could identify patients that have not been recognized or treated. This study is an analytical and clinical validation of X-Ray Artificial Intelligence Tool software (XRAIT) at its development site (a tertiary hospital) and external validation in an adjudicated cohort from the Dubbo Osteoporosis Epidemiology Study (DOES).

Methods: XRAIT uses NLP to perform a Boolean search of radiology reports for fracture and related terms. It can be trained for site-specific reporting styles and use rules to refine identification (e.g. age>50y; bone involved; etc). At the development site, XRAIT was used to search the emergency patient presentations of people over 50 years of age and compared to referrals to FLS (usual care) during the same 3-month period. XRAIT analyzed all plain radiographs and CT scans (n = 5089) while n = 224 were referred to FLS for usual care. External validation: XRAIT was used to analyze digitally readable radiology reports in an untrained cohort from DOES (n = 327) to calculate sensitivity and specificity.

Results: XRAIT identified a 5-fold higher number of potential significant fractures (349/5089) compared to manual case finding (70/224). 339/349 were confirmed fractures (97.1%). Only 29% of those eligible were started or recommended anti-resorptive therapy, including those seen by the fracture liaison service. XRAIT unadjusted for the local radiology reporting styles in DOES had a sensitivity of 69.6% and specificity of 95%.

Conclusion: XRAIT identifies clinically significant fractures efficiently with minimal additional human resources. Its high specificity in an untrained cohort suggests it could be used at other sites. Automated methods of patient identification may assist fracture liaison services to identify fractures that still remain largely untreated.