Abstract

Child abuse is a public health epidemic with devastating consequences for young children. In 2017, there were 676,000 victims of child abuse and neglect in the United States including approximately 1700 deaths. Young children are especially vulnerable - 81% of these deaths occurred among children 0-3 years old. Physical child abuse results in over 120,000 cases a year (less than a quarter of all abuse cases), but accounts for over half of the deaths, speaking to the heightened risk for a child. Fractures are the most common serious injury from physical abuse, occurring more often than abuse-related traumatic brain injury and abdominal injury combined. Each year in the United States there are more than 90,000 emergency department visits for fractures in children age 0-5 years (most often involving the long bones), with abuse-related fractures peaking in the first 3 years of life. It can be extremely difficult for providers to differentiate abuse-related fractures from those associated with an accident in these young children. This difficulty results in a bidirectional problem: under evaluation and missed abuse for some (which may result in re-injury or even death), and over evaluation for abuse and reporting to state child protective services (CPS) for others (which also impacts families negatively, and occurs most often in race/ethnic minority groups). Such “bidirectional” errors in decision making come at a high cost to all involved. These issues highlight the critical need for an evidence-based fracture assessment model to inform medical decision-making when attempting to differentiate abusive from accidental fractures. To address this need, we developed and tested a fracture injury plausibility assessment model (FxIPAM) in 201 children with long bone fractures. We demonstrated its capability to differentiate abuse-related fractures from those resulting from accidental trauma and also demonstrated its theoretical potential to decrease race/ethnic disparities in rates of abuse evaluations, based on model scoring results. Before implementation, validation is required. The goal of this study is to validate an evidence-based model for fracture assessments to improve the clinician’s ability to differentiate abuse from accidental fractures in young children. Therefore, we propose the following aims in a prospective multicenter study of 1000 children, 0-3 years of age, with a long bone fracture: 1) Validate our FxIPAM model by determining its predictive accuracy to differentiate between abuse vs. accidental long bone fractures, and 2) estimate the impact of a hypothetical application of the FxIPAM on abuse assessments and reporting to CPS across race/ethnic groups. Success of this study will result in the first validated model for fracture assessments in young children. The intent of the FxIPAM is not to diagnose abuse but to function as a screening tool to identify children at risk for abuse who require further evaluation and to identify children with plausible injuries where further work for abuse or reporting to CPS may not be required. The potential public health impact of this model is bidirectional: decreased missed abuse and decreased disparities in abuse evaluations and reporting to CPS.