

Pediatric Gymnastic Injuries: Sex and Age-Based Injuries Over The Last 10 Years

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INTRODUCTION

Gymnastics participation has increased by nearly one million participants in the last 10 years, with approximately 4.8 million participants in 2019.^{1,2} The demands of training and the technical aerial maneuvers place gymnasts at risk for both overuse and traumatic injury. Higher injury rates have been shown to occur in competitive gymnastics, with previous studies additionally describing injury characteristics and comparing gymnastic injuries occurring at the collegiate versus youth levels.^{3,4} However, to date there is limited data comparing injury rates to age and periods of peak growth in the pediatric population.

PURPOSE

The purpose of this study was to examine sex and age-based frequencies of gymnastic-related injuries in the pediatric population and to describe differences in injury prevalence during different ages.

METHODS

A descriptive epidemiology study was conducted utilizing publicly available data from the National Electronic Injury Surveillance System (NEISS). The NEISS obtains data on all injuries from contributing emergency departments (EDs) in a network of approximately 100 hospitals. Studies have demonstrated that data from the NEISS is accurate and reliable at describing nonfatal injuries in the US⁶. Pediatric patients from ages 4 to 18 who presented to contributing United States emergency departments (EDs) with gymnastic-related injuries between January 2009 – December 2018 were included and summary statistics were calculated.

REFERENCES

1. Gymnastics Participation Report 2019. Sports & Fitness Industry Association 2019.
2. Lock, S. "Number of participants in gymnastics in the United States from 2006 to 2017." Statista, 9 Aug. 2019.
3. Kerr, Zachary Y., et al. "Epidemiology of National Collegiate Athletic Association Women's Gymnastics Injuries, 2009–2010 Through 2013–2014." *Journal of Athletic Training*, vol. 50, no. 8, 2015, pp. 870–878., doi:10.4085/1062-6050-50.7.02.
4. Lowry CB, Leveau BF. A retrospective study of gymnastics injuries to competitors and noncompetitors in private clubs. *Am J Sports Med*. 1982;10(4):237–239.

Figure 1. Female Gymnastic Injury Trends

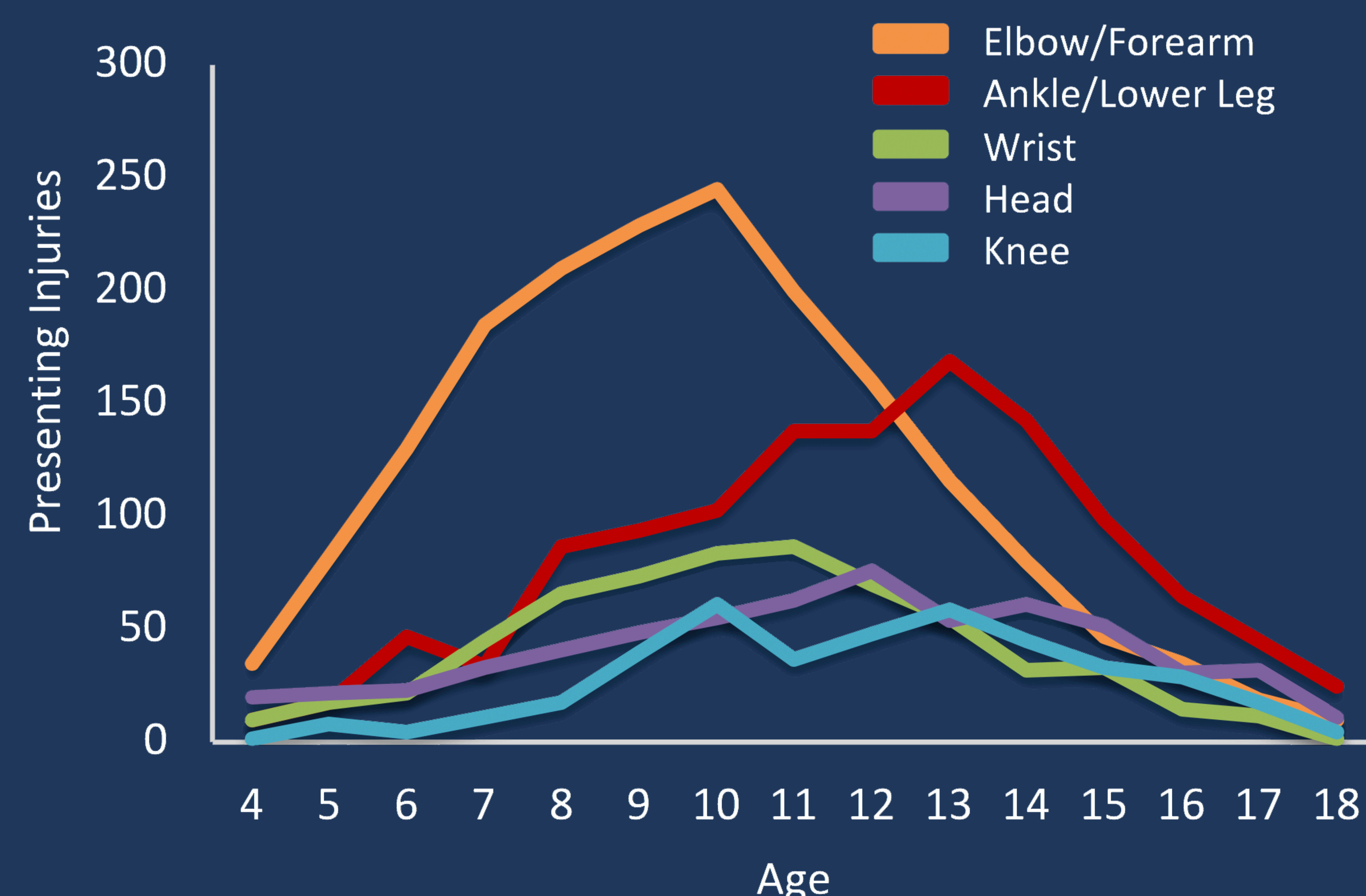
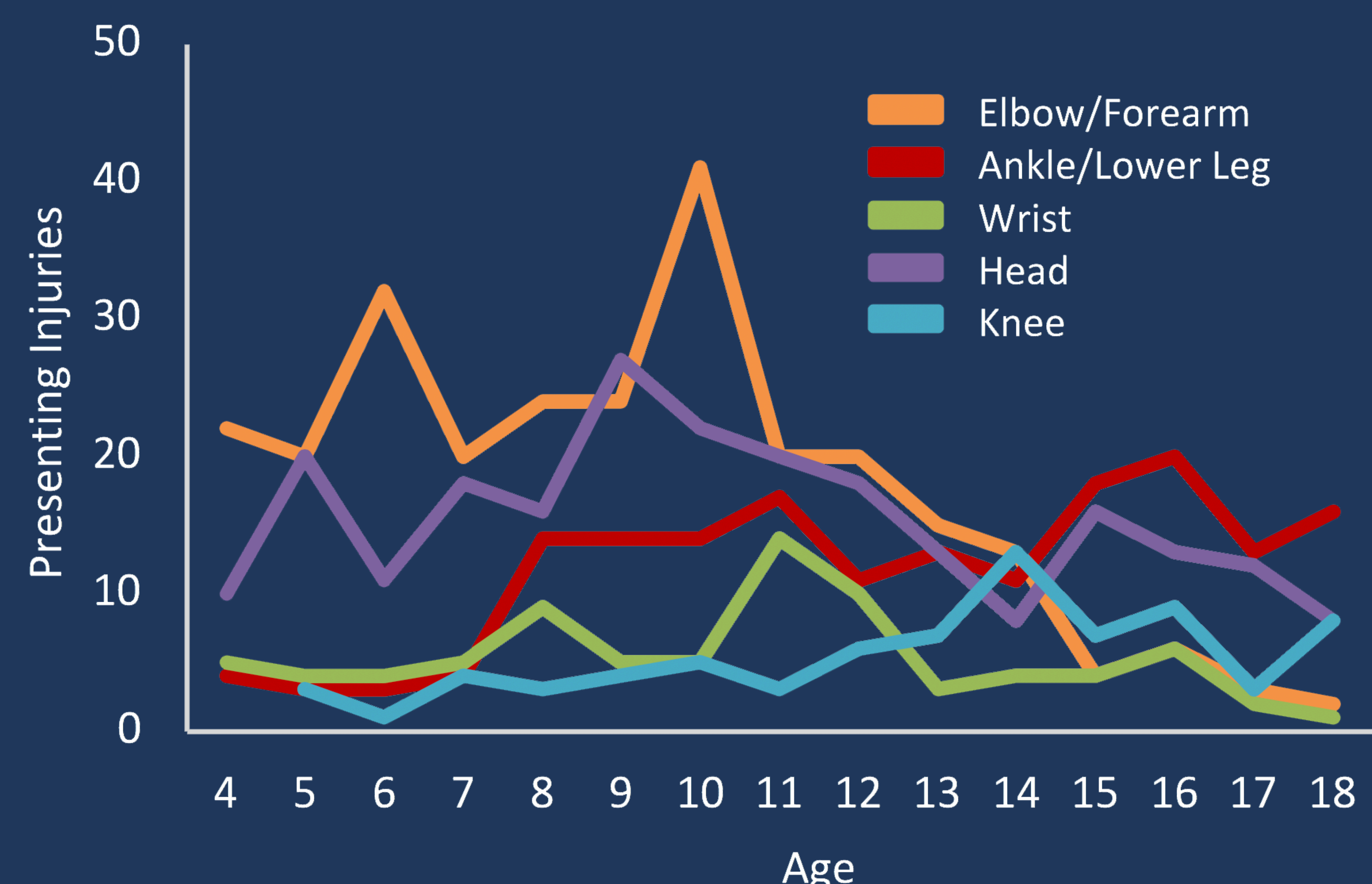


Figure 2. Male Gymnastic Injury Trends



RESULTS

- 9,255 diagnosed gymnastic-related injuries (Female: 83.3%; Male: 16.7%)
- Average age of 10.6 years (Female: 10.6 years; Male: 10.3 years)

Upper Extremity

- In females ages 4 to 8, 55.7% of all injuries occurred in the upper extremity
- In females ages 4 to 10, fractures (67%) were the most frequent diagnosis
- In females ages 4 to 10, a 600.0% increase in elbow and forearm injuries was observed
- In females ages 6 to 8, a 200% increase in wrist injuries was noted
- Elbow and Forearm injuries peaked from ages 8 to 10 in both male and female gymnasts

Lower Extremity

- Females ages 8 to 10 demonstrated the largest increase in knee injuries, which do not decrease until age 13
- Ankle and lower leg injuries peaked at age 13 in females and age 16 in males and predominated over knee injuries.

CONCLUSIONS

1. In gymnastics, upper extremity injuries peak prior to age 10, while ankle and lower leg injuries peak years later.
2. Unlike injury trends in running and cutting sports where knee injuries are demonstrated to peak in females at 13-15 years of age following puberty, female gymnast knee injuries demonstrated their largest increase between ages 8-10 and gradually begin decreasing after age 13.
3. These trends suggest that injury prevention programs intended to reduce pediatric gymnastic injuries should focus on injuries of the upper extremity at younger ages, and later tailor preventative measures towards the lower extremity.