Experience of a neurology service during the 2016 Olympic and Paralympic Games

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Abstract

Background

We analyzed the utilization of acute neurologic care during the 2016 Olympic and Paralympic Games in Rio de Janeiro.

Methods

We conducted a retrospective analysis of data collected during the games.

Results

Sixty-three neurologic evaluations were performed in patients from the Olympic Family (OF), 22 of these involving athletes from 19 countries. Traumatic brain injuries (TBIs) were the most frequent reason for assessment among athletes, some associated with poly-trauma. Four patients were admitted to the neurocritical care unit (NICU): 2 acute ischemic strokes, 1 TIA, and 1 polytrauma with moderate TBI. Among nonathletes, evaluation of TBI associated with motor vehicle accidents was surprisingly high, with 10 assessments, none requiring admission. Also, nonathletes with seizures, multiple sclerosis flare, functional deficits, and psychiatric complaints received neurologic evaluation. During the Paralympic Games, 17 neurologic evaluations were performed in patients from the Paralympic Family (PF), 13 involving athletes from 10 countries. Five athletes presented with mild TBI. One PG training coach was admitted to the NICU after receiving alteplase for an acute ischemic stroke.

Conclusions

As expected, many athletes with sports-related injuries were evaluated, but cases of diverse acute neurologic pathologies were observed among nonathlete members of the OF and PF. Olympic Games are large, logistically complex events involving thousands of people. Our observations suggest that a comprehensive and detailed plan for neurologic emergencies should be considered for future games.

Olympic Games (OG) and Paralympic Games (PG) are enormous events, involving not only numerous athletes from several countries, but also their training personnel, supporting staff and organizers, country dignitaries, media workers, and thousands of attendants. The 2016 OG and PG were held in Rio de Janeiro, Brazil, and attended by 11,238 athletes from 207 participating nations (OG) and by 4,342 athletes from 159 nations (PG).

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The Olympic Village and the competition sites had small polyclinics with access to laboratorial and imaging diagnostics and could care for simpler injuries.

Since the first OG in 776 BC, physicians have been involved in the support for the games.¹ One of the first and most famous physicians with special interest in sports medicine was Herodicus, the teacher of Hippocrates.¹

During the first games of the modern era (since 1896), no organized medical teams were present, and care was provided by doctors who were also competing athletes or from general attendance.¹ In the 1908 games in Athens, ambulances and first aid stations staffed by physicians were arranged along the marathon route.¹ It was only in 1924 that the United States sent for the first time a chief medical officer, and for the OG of 1932 in Los Angeles, a small hospital with laboratory and radiographic equipment was erected inside the Olympic Village.¹

The medical care for the 2016 OG and PG was divided in levels of complexity. Athletes were primarily cared for by the health personnel from their National Olympic Committees. The Olympic Village and the competition sites had small polyclinics with access to laboratorial and imaging diagnostics and could care for simpler injuries. The Americas Medical City (AMC) is a hospital complex situated in close proximity to the Olympic Village and competition sites and was selected by the International Olympic Committee and the Organizing Committee of the Olympic and Paralympic Games Rio 2016 (Rio 2016), to serve as the referral hospital for complex cases. The AMC was responsible for the care of the Olympic Family (OF) and Paralympic Family (PF), consisting of athletes and their training personnel, Rio 2016 support and technical teams, dignitaries and governmental officials from participating countries, and credentialed media. The neurology and neurocritical care teams were recruited to design and direct a comprehensive program of acute emergency neurology. The plan included a 10-bed neurocritical care unit (NICU), as well as around the clock emergency neurologic support, including endovascular stroke care and neurosurgery. A team of neurologists staffed the emergency department (ED) in-house at all times. Since the 2008 games in Beijing, the International Olympic Committee records data on the *International Olympic Committee* (IOC) injury surveillance system, but it is a report restricted to the competing athletes with very few descriptions regarding neurologic illnesses.² We describe our experience as a neurology/neurocritical care service during the 2016 OG and PG in Rio de Janeiro, Brazil.

Methods

All evaluations performed by the neurology team in the ED were recorded. Data on patients admitted to the NICU were also reviewed. Patients were seen from July to September 2016. The information was deidentified for purposes of preserving confidentiality. Data on age, sex, profession, sport (for the athletes), initial diagnosis and discharge diagnosis, imaging results, treatment, and disposition were reviewed.

Standard protocol approvals, registrations, and patient consents

This study was evaluated and approved by the hospital institutional review board. The necessity of obtaining informed consent was waived due to its retrospective nature and deidentification of data prior to analysis.

Data availability

Anonymized data will be shared by request from any qualified investigator.

Results

Olympic Games

Sixty-three neurologic evaluations were performed in the ED in patients from the OF, 22 of these involving athletes from 19 countries (table 1). TBIs were the most frequent reason for assessment among athletes, with 14 cases. Of these, 12 were mild (6 from cycling, 2 from field hockey, 3 from boxing, 1 from rowing) and 2 were moderate (1 from cycling and 1 from water polo). All cases from cycling also involved injuries other than the TBI. Other cases of isolated concussions were assessed locally in the polyclinics and did not require referral to the hospital.² None of the patients had any obvious neurologic sequelae upon discharge. One athlete was evaluated for syncope, 2 for cervical pain, and 5 others for lumbar pain, with only 1 requiring admission for pain control.

Among nonathletes, evaluation of TBI associated with motor vehicle accidents was surprisingly high, with 10 assessments,

Table 1 Most common neurologic diagnoses among athletes and nonathletes during the 2016 Olympic Games

Athletes (n = 22)	Nonathletes (n = 41)
TBI: 12 mild, 2 moderate	MVC with TBI: 10
Lumbar pain: 5	Lumbar pain: 11
Cervical pain: 2	Headache: 6
Syncope: 1	Acute ischemic stroke: 2
	TIA: 1
	Others: seizure, multiple sclerosis flare, psychiatric disorders, functional neurologic symptoms.

Abbreviations: MVC = motor vehicle collisions; TBI = traumatic brain injury.

Traumatic brain injuries were the most frequent reason for assessment among athletes, with 14 cases.

none requiring admissions. Also, nonathletes with seizures, multiple sclerosis flare, functional deficits, or psychiatric complaints received neurologic evaluation. Finally, 6 other patients presented with headaches and 11 with lumbar pain, all treated as outpatients.

Four patients were admitted to the NICU: 2 ischemic strokes (1 treated with alteplase), 1 TIA (all in nonathletes), and 1 polytrauma with TBI (cycling athlete).

Thirty-nine CT scans of the head, 22 CT scans of the cervical spine, and 14 MRI scans (3 of the brain and 11 of the spine) were performed in evaluation involving the OF.

Paralympic Games

Seventeen neurologic evaluations were performed in patients from the PF, 13 involving athletes from 10 countries (table 2).

Five athletes with mild TBI were assessed, 2 from cycling, 1 from sailing, 1 from equestrian, and 1 from soccer.

Paralympic athletes were also evaluated for lumbar pain, dystonia, seizures, cervical trauma, pseudostroke (conversion disorder), and headaches.

One PG training coach was admitted to the NICU after receiving alteplase for an acute ischemic stroke.

Thirteen CT scans of the head, 7 CT scans of the cervical spine, 3 CT scans of the lumbar spine, and 4 brain MRI scans were performed during the PG.

Table 2 Most common neurologic diagnoses among athletes and non-athletes during the 2016 Paralympic Games

Athletes (n = 13)	Nonathletes (n = 4)
TBI: 5 mild	Headache: 2
Lumbar pain: 2	Acute ischemic stroke: 1
Cervical pain: 2	Lumbar pain: 1
Others: headache, dystonia, functional neurologic deficits, seizures	

Abbreviation: TBI = traumatic brain injury.

TAKE-HOME POINTS

- Sports-related neurologic injuries are common among athletes from several sports during Olympic Games and Paralympic Games.
- Acute neurologic disorders, such as strokes, seizures, and trauma, were seen among the nonathlete members of the Olympic/Paralympic Family.
- A comprehensive and detailed plan for neurologic emergencies should be considered for future games.

Discussion

The IOC prepared a comprehensive health support system for the 2016 games, with high integration among all levels of complexity. It is not a surprise that most neurologic injuries involving athletes are concussion/TBIs, with 3 of them requiring admission to the NICU, all with favorable outcomes. The novelty of this report is the high utilization of a neurology service by the OF and PF. During the months preceding the games, a major concern regarding the ongoing Zika virus (ZIKV) outbreak had prompted some researchers to suggest canceling or moving the games to another country.³ The games occurred during a time of the year with a lower population of mosquitoes, and several precautions were implemented by the organizing committee. There were no reported cases of ZIKV infection among athletes.⁴ Serologic prospective studies have reinforced the findings.^{4,5} Despite the sizable number of neurologic assessments and usage of neuroimaging, most athletes were appropriately cared for by the neurologist in the ED and could return to the Olympic Village without requiring an admission, suggesting that it might be a cost-effective approach that would not interrupt the tight training schedule athletes have during the games. At times, non-neurologists evaluating Olympic athletes might feel insecure about neurologic complaints, ordering expensive, time-consuming, unrevealing tests. It is also worth mentioning that even though among athletes the utilization of in-hospital/high complexity services was uncommon, the same cannot be said about the vast majority of the OF. The fact that 3 patients required acute intervention for ischemic stroke reinforces the necessity of an acute neurology service, also highlighting that many of the training/support personnel have multiple risk factors different from the athletes. In several other situations, the expertise of a neurologist was required, including cases of conversion disorders, dystonia, seizures, multiple sclerosis flare, and migraine attacks. Our current experience might serve as an aid for the planning of future major sports events.

As expected, many athletes with sports-related injuries were evaluated, but cases of diverse acute neurologic pathologies were observed among nonathlete members of the OF and PF. OG are large, logistically complex events involving thousands of people. The care is not restricted to athletes, but also

includes several other people with considerable risk for acute neurologic complications. Our observations suggest that a comprehensive and detailed plan for neurologic emergencies should be considered for future games.

Author contributions

I.R.F. Da Silva participated in the design of the study, data analysis, interpretation of data, and manuscript drafting. L. Gouvea participated in the design of the study, interpretation of data, and manuscript drafting. C.B. Nogueira participated in the design of the study, data analysis, and manuscript drafting. V. Cravo participated in the design of the study, data analysis, and manuscript drafting. B.B. Liberato participated in the design of the study, interpretation of data, and manuscript drafting.

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Disclosure

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