

Caffeine Consumption Among Orthopedic Residents Is Higher Than the General Population

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Abstract

Background: Orthopaedic surgery residency can be quite demanding at times and leads many residents to consume stimulants, caffeine, to perform their work duties.

Question/Purpose: The purpose of this study was to evaluate caffeine consumption among orthopedic surgery residents. We hypothesized that compared to the general population, residents will consume more caffeine.

Patients/Methods: An electronic survey consisting of 13 multiple-choice questions was created to query residents on their caffeine consumption. The survey link was e-mailed to all residency program coordinators in the United States who then forwarded the survey to their residents. A subgroup analysis was performed based on respondents' post-graduate year (PGY), to identify variations in caffeine use.

Results: We received 209 surveys which represents 5.4% of orthopedic residents in the country. Of those 209 residents, 189 (90.4%) indicated regular caffeine usage. Of those who consume caffeine 59.8% indicated that they need caffeine to perform their work while 64.6% indicated that they are dependent on caffeine. Nearly one-fourth (24.3%) of respondents indicated that they consume more than 400 mg of caffeine/day. There were no significant relationships across resident PGY groups.

Conclusion: We have demonstrated a large proportion of orthopedic surgery residents consume caffeine. When used in moderation, caffeine can be beneficial by improving efficiency, alertness and memory however, in high doses it may have undesirable side effects.

Level of Evidence: Level IV evidence

Introduction

Fatigue associated with long hours in the medical profession has been shown to affect both physician and patient safety [1-3]. Caffeine is used to mitigate the effects of fatigue, making it the most frequently consumed nervous system stimulant in the world [4]. Caffeine is a naturally occurring alkaloid substance found in numerous plant species including the seeds, leaves, and fruit of coffee, tea, cocoa, guarana, and more than 60 other plants [5]. Energy drinks are now a commonly used source of caffeine and market value is predicted to reach \$61 billion by 2021 [6]. Energy drinks are promoted as supplements that can boost performance and cognition, but have been reported to have side effect [6-9].

The purpose of this study was to evaluate the consumption of caffeine among orthopedic surgery residents. We hypothesized that compared to the general population, orthopedic surgery residents will consume more caffeine.

Materials and Methods

An electronic survey was created to query orthopedic residents on their caffeine consumption. It consisted of 13 multiple choice questions and was made using Google Surveys (Google; Mountain View, CA). The link to the survey was e-mailed to all orthopedic residency program coordinators in the United States who then

forwarded the survey to their residents. The survey remained active for a 2-week period between March and April of 2020 and responses were made anonymous.

Descriptive statistics were used to evaluate the data along with a chi-square test of independence. A subgroup analysis was performed based on respondents' post-graduate year (PGY), to identify variations in caffeine use. All analyses were performed using Minitab (Minitab, Inc; State College, PA), and significance was set at $p = 0.05$.

Results

We received 209 completed surveys which represents approximately 5.4% of all orthopedic residents in the country [10]. Of those 209 residents, 189 (90.4%) participants indicated regular caffeine usage. Over half of the residents who consume caffeine (59.8%) indicated that they need caffeine to perform their daily work duties while 64.6% indicated that they are dependent on caffeine and will experience withdrawal symptoms if they do not consume it daily (Table 1).

Table 1: Descriptives (N = 189, who indicate regular consumption of caffeine)

Descriptives (N = 189, who indicate regular consumption of caffeine)	Percentage and Count N=189
Need Caffeine to Perform Daily Work Duties	59.8%, n= 113
Feel Withdrawal Symptoms without Sufficient Caffeine (headache, malaise, etc.)	64.6%, n= 122
Performance Ever Negatively Affected by Caffeine	12.2%, n= 23
Sources of Caffeine Used Regularly (not mutually exclusive)	
Coffee/tea	89.9%, n= 170
Energy drinks	48.1%, n= 91
Supplements	14.3%, n= 27
Food	1.1%, n= 2
Other	6.3%, n= 12
Amount of Caffeine Consumed Daily	
<200 mg	20.1%, n= 38
200–400 mg	34.4%, n= 65
400–600 mg	17.5%, n= 33
> 600 mg	6.9%, n= 13
Unsure	21.2%, n= 40
Rotation with Most Caffeine Consumption	
Same for All	5.3%, n= 10
Arthroplasty	3.2%, n= 6
Hand	3.7%, n= 7
Trauma	64.0%, n= 121
Spine	5.3%, n= 10
Pediatrics	0.5%, n= 1
Night Float/Call	15.3%, n= 29
Other	2.6%, n= 5
Concerned about Amount of Caffeine Consumed	12.7%, n= 24
Sleep Affected by Caffeine	12.2%, n= 23
Began Consuming Caffeine	
Began Consuming Caffeine	
High School	26.9%, n= 56
College	36.5%, n= 69
Medical School	27.0%, n= 51
Residency	6.9%, n= 13

Respondents were asked about their preferred sources of caffeine. They could make multiple selections in this category which may be seen in Table 1. Coffee was the preferred source of caffeine as 170 (89.9%) residents indicated that they consume it on a regular basis ($p < 0.001$). Energy drinks were the second most popular source of caffeine as 91 (48.1%) residents indicated they drink them regularly. In a direct comparison, coffee and tea are consumed more than energy drinks ($p < 0.001$). There was an even distribution of milligrams (mg) consumed per day from < 200 mg to > 600 mg. Nearly one-fourth (24.3%) of respondents indicated that they consume more than 400 mg of caffeine per day and forty residents (21.2%) were unsure how much daily caffeine they consumed. A majority of residents (64%) felt that they consumed the

most caffeine on their trauma rotations ($p < 0.001$) (Table 1). Most residents (84.2%) reported they began consuming caffeine prior to residency ($p < 0.001$).

Table 2 demonstrates a nearly even distribution of responses across PGY classes except for fellows. Due to the low number of responses from fellows their responses were excluded from the subgroup analysis. There were no statistically significant differences across resident PGY groups. Universally the most caffeine is consumed on trauma followed by night float/call shift rotations. Though not statistically significant, residents reported increasing concern regarding their caffeine consumption from PGY-1 to PGY-5 (Table 2).

Table 2: Comparisons of PGY Levels on Caffeine Factors (N = 185)

Comparisons of PGY Levels on Caffeine Factors (N = 185)	PGY-1 N=33	PGY-2 N=49	PGY-3 N=37	PGY-4 N=30	PGY-5 N=36	PGY-5 N=36
Need Caffeine to Perform Daily Work Duties	75.8%	59.2%	75.7%	60.0%	58.3%	$p=0.262T$
Feel Withdrawal Symptoms without Sufficient Caffeine	63.6%	61.2%	67.6%	63.3%	44.4%	$p=0.302$
Performance Ever Negatively Affected by Caffeine	9.1%	16.3%	10.8%	16.7%	8.3%	$p=0.706$
Sources of Caffeine Used Regularly						
Coffee/tea	90.9%	89.8%	89.2%	90.0%	88.9%	$p=1.000$
Energy drinks	39.4%	57.1%	40.5%	53.3%	52.8%	$p=0.411$
Supplements	12.1%	12.2%	24.3%	16.7%	8.3%	$p=0.388$
Food	3.0%	2.0%	0.0%	0.0%	0.0%	$p=0.790$
Other	6.1%	4.1%	10.8%	3.3%	8.3%	$p=0.708$
Amount of Caffeine Consumed Daily						
< 200 mg	21.2%	16.3%	16.2%	23.3%	27.8%	$p=0.028$
200–400 mg	18.2%	36.7%	35.1%	36.7%	41.7%	
400–600 mg	21.2%	16.3%	13.5%	26.7%	11.1%	
> 600 mg	6.1%	6.1%	21.6%	0.0%	0.0%	
Unsure	33.3%	24.5%	13.5%	13.3%	19.4%	
Rotation with Most Caffeine Consumption						
Same for All	3.0%	2.0%	8.1%	6.7%	5.6%	$p=0.242$
Arthroplasty	0.0%	4.1%	2.7%	6.7%	2.8%	
Hand	0.0%	8.2%	2.7%	0.0%	5.6%	
Trauma	81.8%	49.0%	62.2%	76.7%	58.3%	
Spine	3.0%	4.1%	8.1%	6.7%	5.6%	
Pediatrics	0.0%	0.0%	0.0%	0.0%	2.8%	
Night Float/Call	9.1%	28.6%	13.5%	0.0%	19.4%	
Other	3.0%	4.1%	2.7%	3.3%	0.0%	
Concerned about Amount of Caffeine Consumed	6.1%	8.2%	16.2%	16.7%	19.4%	$p=0.335$
Sleep Affected by Caffeine	15.2%	10.2%	5.4%	20.0%	13.9%	$p=0.420$
Began Consuming Caffeine						
High School	27.3%	26.5%	40.5%	33.3%	22.2%	$p=0.468$
College	36.4%	34.7%	37.8%	33.3%	41.7%	
Medical School	27.3%	38.8%	16.2%	23.3%	27.8%	
Residency	9.1%	0.0%	5.4%	10.0%	8.3%	

Discussion

Most Americans consume caffeine, as 85% drink at least one caffeinated beverage daily averaging 150-200 mg of caffeine [7]. Our goal for this study was to evaluate the consumption of caffeine among orthopedic surgery residents and compare it to the general population.

As we expected the amount of caffeine consumed among orthopedic surgery residents would be greater than the general population [7]. In our study cohort 90% (189 out of 209) of respondents consumed caffeine daily with 59% of them consuming more than 200 mg/day. The Food and Drug Administration recommends limiting caffeine consumption to 400 mg/day, however, nearly one-fourth of residents (24.3%) exceeded this limit. Increased consumption of caffeine among our study population is most likely due to the rigors placed on them at work combined with sleep deprivation. Previously reported by Basner et al., the average number of hours spent sleeping across all rotations by an intern averaged 6.8 hours and 2.19 hours during a call shift [11].

Although caffeine can be beneficial by improving mental focus, alertness, and memory, it may lead to agitation, tremors as well as dependency and withdrawal [4,10]. Daily energy drink consumption has also been found to have numerous deleterious cardiovascular side effects [6,10]. Most surveyed residents indicated that they feel withdrawal symptoms if they do not consume caffeine daily. Additionally, roughly 12% of the residents felt that caffeine not only negatively affected their work but, also led to disruptions in their sleep although a minority of the cohort (12%), was concerned about the amount of caffeine they consumed.

The weakness of our study is that of many survey studies as we were not able to survey the entire cohort of orthopedic surgery residents. However, this is the first study to evaluate caffeine consumption among residents in any medical specialty.

We have demonstrated that when compared to the general population, a larger proportion of orthopedic surgery residents consume caffeine. Additionally, nearly 25% of surveyed residents are consuming more caffeine than the recommended maximal dose by the FDA. Though this is the first study in the medical literature documenting caffeine usage among residents, we do not believe this to be an isolated finding to orthopedic surgery. Residents in other medical specialties are likely using caffeine in the same manner. When used in moderation, caffeine can be beneficial by improving efficiency, alertness and memory however, in high doses it may have undesirable side effects.

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