The prevalence of imposter syndrome among young neurosurgeons and residents in neurosurgery: a multicentric study

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OBJECTIVE Imposter syndrome (IS) occurs when high-achieving individuals have a pervasive sense of self-doubt combined with fear of being exposed as a fraud, despite objective measures of success. This is one of the main causes of burnout among professionals, threatening their mental health and general well-being. The prevalence and severity of IS among neurosurgery residents and young neurosurgeons has not been yet studied. The primary outcomes of this study were the prevalence and severity of IS.

METHODS An anonymous cross-sectional survey including both a demographic questionnaire (Clance Imposter Phenomenon Survey) and compensatory mechanisms was distributed to young neurosurgeons and residents in neurosurgery in Italy.

RESULTS A total of 103 responses were collected. The prevalence rate was 81.6%. Among the respondents with IS, 42.7% showed moderate signs, 27.2% frequent, and only 11.7% had an intense symptomatology. Level of education, female sex, and academic achievements were all identified as predictive factors of IS.

CONCLUSIONS A total of 81.6% of respondents reported potentially significant levels. The implications of IS on both the outcomes in patients and the well-being of neurosurgeons should be evaluated in future studies.

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KEYWORDS imposter syndrome; residency; burnout syndrome; impostorism

C lane and Imes first described imposter syndrome (IS), also known as imposter phenomenon, in their landmark article in 1978. Starting from a study in 150 doctoral-level-educated women, they defined IS as “an internal experience of intellectual phoniness.” IS is characterized by a chronic sense of self-doubt coupled with a constant worry of being discovered as a fraud, despite professional accomplishments and often remarkable academic achievements.

Several studies have identified relatively high prevalence regardless of ethnicity and age groups. In the medical community, IS is thought to increase burnout, depression, and anxiety. A recent meta-analysis has also found that half of neurosurgeons and residents in neurosurgery showed signs of burnout syndrome. The latter is acknowledged as a syndrome of emotional exhaustion, cynicism, and reduced effectiveness at work, which has been linked to poor health, alcoholism, depression, and suicide in physicians. Given the importance of the topic and its multiple social implications, IS has become a widely addressed topic in the literature. There are a number of studies focused on the prevalence and severity of IS among physicians, physicians in training, general surgery trainees, and medical students.

Nevertheless, there are no studies concerning work stress and IS within the neurosurgical community, despite neurosurgery being one of the most competitive, and physically and mentally demanding fields. The primary aim of...
this study was to define the prevalence of IS among young neurosurgeons and neurosurgery residents. The secondary aim was to identify risk factors associated with IS.

Methods

Survey Design

This survey was designed to assess the prevalence of IS among young Italian neurosurgeons and neurosurgical trainees. Survey items were adapted from previously published scoring systems that have already been validated in other medical specialties.2,10 Ethical approval was waived by the local ethics committee in view of the nature of the study.

Survey Distribution and Administration

The survey was generated with Google Forms (Google LLC). Data were collected and automatically transferred to a spreadsheet; the collection period was between November 1 and December 1, 2021.

To reach both residents in neurosurgery and young neurosurgeons (≤ 40 years of age), the link to the survey was distributed via email through a national mailing list; an additional reminder was sent to the Italian Young Neurosurgeons’ social media groups. Respondents had 30 days to fill in the survey. After the first notification, two reminders were sent during weeks 2 and 3. All the responses were given anonymously.

Survey Content

The survey consisted of 3 different parts: demographics (sex, age, level of education, and place of work); Clance Imposter Phenomenon Survey (CIPS); and analysis of potential compensatory mechanisms (participation in congresses, number of hours worked). CIPS is a cross-culturally validated survey that consists of a 20-item list used to search for imposter characteristics. Responses to each statement are scored along a 5-point scale reflecting the degree of imposter-like feelings ranging from 6 to 100, with a total score of ≤ 40 indicating few imposter characteristics; 41–60 moderate IS; 61–80 frequent IS; and > 80 intense IS feelings. All the subjects who scored a value > 40 on the CIPS were considered to be affected by IS.

Statistical Analysis

Count data are reported as frequencies and percentages, whereas continuous data are reported as the mean and standard deviation with the range. Univariate and a multivariate ANOVA and independent-samples t-tests were used to examine associations of certain variables with scores on the CIPS, where appropriate. A 2-sided alpha value of 0.05 was prespecified to be statistically significant. Data from the surveys were collected and managed through Excel (Microsoft, Inc.).

Results

Demographic Data of Respondents

We received a total of 103 answers of a possible 437 respondents, achieving a response rate of 23.6%. All demographic data are summarized in Table 1. Among the respondents, 59 (57.3%) were male and the remaining 44 (42.7%) were female. As for their level of education, there were 76 residents (73.8%), 4 (3.9) fellows, and 23 attending surgeons (22.3%), 18 (17.5%) of whom had or were working on a PhD. Most survey respondents (89, 86.4% of those who answered) were working at an academic hospital, whereas the remaining 14 (13.6%) were employed at a regional or local hospital.

Prevalence of Imposterism Among Neurosurgeons

According to this definition of IS, a total of 84 respondents (81.6%) had moderate to intense signs of the syndrome. All data on prevalence are summarized in Table 2. Among the respondents, 59 (57.3%) were male and the remaining 44 (42.7%) were female. As for their level of education, there were 76 residents (73.8%), 4 (3.9) fellows, and 23 attending surgeons (22.3%), 18 (17.5%) of whom had or were working on a PhD. Most survey respondents (89, 86.4% of those who answered) were working at an academic hospital, whereas the remaining 14 (13.6%) were employed at a regional or local hospital.
alence of IS was 63% among neurosurgeons, whereas it was 88.2% among residents in neurosurgery. The difference in prevalence was statistically significant (p = 0.014). There was also a significant difference in the severity of symptoms showed (p = 0.001). When senior residents were compared with junior residents, no difference was noticed in terms of severity of symptoms and prevalence of IS.

Other than the level of education, female sex (p = 0.001) and academic achievements (p = 0.001) was identified as predictive factors of IS. In the multivariate analysis a correlation was found between an intense level of IS and female sex, the pursuit of an academic career, or working in an academic hospital. Residents in neurosurgery were divided into junior (from the first to the third year) and senior (fourth and fifth year) residents for a further comparative analysis.

Compensatory Mechanisms for IS

To see whether the people with imposterism were more prone to compensate for their feeling of guilt, the respondents were asked about their working schedule. All data on compensatory mechanisms are summarized in Table 3. It was found that most respondents (42.7%) work approximately 61–80 hours per week, 22.3% work 40–60 hours, 27.2% work 81–100 hours, and only a small minority works > 100 hours per week. No statistical difference was found between the hours worked by neurosurgeons and residents. However, a statistical difference was found in the hours worked in residents and neurosurgeons with a high-intensity IS (p = 0.013). All statistical analysis is summarized in Table 4.

Some have suggested that IS is a double-edged sword: in certain cases, physicians may benefit from a degree of imposterism because it increases their drive to succeed, although others are directly inhibited by it. As suggested in the existing literature, gathering data about the relationship between IS and clinical competence could be of importance. To analyze this relationship, we decided to evaluate the number of papers read per week by our respondents.

Most respondents (48.5%) were found to read 0–1 article per week, 36.9% read approximately 2–5 articles per week, and only 14.6% read > 5 articles per week. A positive correlation was found between the number of articles read per week by young neurosurgeons and IS. In the multivariate analysis, a correlation was found between female sex and the severity of the IS, the number of hours worked per week, and the number of articles read.

The participation in congresses and formation courses were also investigated. Of the 103 respondents, 44.7% reported participating in 0–1 event per year, 45.6% in 2–5 events, and only 9.7% in > 5 events per year. No statistical difference was found when young neurosurgeons and residents were considered separately.

Discussion

In this cross-sectional study of 103 young neurosurgeons and residents in neurosurgery, the majority of participants experienced frequent imposter-like feelings. Several studies in other surgical specialties have already highlighted that there is no significant association between the degree of IS and the ethnicity/race of the clinician or the region of the country of residence.2,10 Still, we found a positive correlation between the degree of IS and the level of medical experience, in that more experienced clinicians reported significantly less IS.

We assumed that some characteristics could turn out to be correlated with the presence or level of imposterism.

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### TABLE 2. Prevalence of IS and its symptomatology within the interviewed population

<table>
<thead>
<tr>
<th>Total No. (%)</th>
<th>No. of Neurosurgeons (%)</th>
<th>No. of Residents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS Present</td>
<td>19 (18.4)</td>
<td>17 (63)</td>
</tr>
<tr>
<td>Not present</td>
<td>84 (81.6)</td>
<td>10 (37)</td>
</tr>
<tr>
<td>Imposter symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Few</td>
<td>19 (18.4)</td>
<td>10 (37)</td>
</tr>
<tr>
<td>Moderate</td>
<td>44 (42.7)</td>
<td>12 (44.4)</td>
</tr>
<tr>
<td>Frequent</td>
<td>28 (27.2)</td>
<td>2 (7.4)</td>
</tr>
<tr>
<td>Intense</td>
<td>12 (11.7)</td>
<td>3 (11.1)</td>
</tr>
</tbody>
</table>

### TABLE 3. Compensatory mechanisms presented by the respondents

<table>
<thead>
<tr>
<th>Hrs of work/wk</th>
<th>Total No. (%)</th>
<th>No. of Neurosurgeons (%)</th>
<th>No. of Residents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40–60</td>
<td>23 (22.3)</td>
<td>6 (22.2)</td>
<td>17 (22.4)</td>
</tr>
<tr>
<td>61–80</td>
<td>44 (42.7)</td>
<td>9 (33.3)</td>
<td>35 (46.1)</td>
</tr>
<tr>
<td>&gt;100</td>
<td>8 (7.8)</td>
<td>3 (11.1)</td>
<td>5 (6.6)</td>
</tr>
<tr>
<td>Articles read/wk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>50 (48.5)</td>
<td>9 (33.3)</td>
<td>41 (53.9)</td>
</tr>
<tr>
<td>2–5</td>
<td>38 (36.9)</td>
<td>13 (48.1)</td>
<td>25 (32.9)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>15 (14.6)</td>
<td>5 (18.5)</td>
<td>10 (13.2)</td>
</tr>
<tr>
<td>Congresses/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1</td>
<td>46 (44.7)</td>
<td>12 (44.4)</td>
<td>34 (44.7)</td>
</tr>
<tr>
<td>2–5</td>
<td>47 (45.6)</td>
<td>13 (48.1)</td>
<td>34 (44.7)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>10 (9.7)</td>
<td>2 (7.4)</td>
<td>8 (10.5)</td>
</tr>
</tbody>
</table>

### TABLE 4. Summary of the statistical analysis

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Univariate Analysis</th>
<th>Multivariate Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Level of education</td>
<td>0.014</td>
<td>0.001</td>
</tr>
<tr>
<td>Academic achievement</td>
<td>0.001</td>
<td>0.62</td>
</tr>
<tr>
<td>Working at academic hospital</td>
<td>0.271</td>
<td>0.034</td>
</tr>
<tr>
<td>Hours worked</td>
<td>0.151</td>
<td>0.013</td>
</tr>
<tr>
<td>Papers read</td>
<td>0.046</td>
<td>0.017</td>
</tr>
<tr>
<td>Participation in congresses</td>
<td>0.24</td>
<td>0.072</td>
</tr>
</tbody>
</table>
When evaluating sex, years of training, and any possible academic achievements (considered in this case by the presence of a PhD degree), we found strong correlation between sex and IS (female neurosurgeons and residents in neurosurgery were more prone to be affected by IS), as well as between having a PhD degree and IS. Interestingly enough, this statistical difference was also retained when we compared these two factors (sex and PhD) and the severity of symptoms. A recent article addressing the gender features that influence behavior in workplaces like neurosurgery suggested that women in such a field of work are more prone to be affected by IS because they tend to express their own fears and point out their flaws, thus undermining themselves.\(^4\) As for the general level of education, not only was a strong difference found in terms of the prevalence of IS between residents and young neurosurgeons, numbers differ greatly also in the severity of the symptomatology, with residents presenting a higher rate of more severe symptoms. When junior residents were considered separately from senior residents, no statistical difference was found in terms of prevalence and severity of symptoms.

Since the first publication of Clance and Imes about the topic,\(^1\) several studies investigating IS in medical trainees in various fields have been published. Similarly to our findings, IS was more prevalent among female residents, and individuals with IS were more likely to experience depression, anxiety, and low self-esteem.\(^11\) In another interesting pilot study in which the level of burnout and IS in medical students at Jefferson Medical College was discussed, Villwock et al. discovered that IS was more prevalent among female medical students.\(^12\) There was a significant positive trend between race/ethnicity and imposter feelings in that minorities experienced IS more than their majority counterparts. IS was associated with burnout, cynicism, emotional exhaustion, and depersonalization.\(^12\)

Based on their findings, the investigators concluded that there were several potential implications of IS for medical training; e.g., students who experience IS may be less likely to speak up or volunteer answers than unaffected peers, and individuals with IS may have innate differences in learning styles. The investigators urged educators to consider tailoring medical education curriculum to account for learners with IS.\(^13\)

The correlation between IS and burnout syndrome should also be further investigated.\(^13\)–\(^15\) According to recent studies, neurosurgery remains the medical specialty with the highest rate of burnout, not only among neurosurgeons but also among residents in neurosurgery.\(^5\)

The prevalence of IS, especially in a community of young neurosurgeons, could indeed represent a significant burden in terms of psychological impact both in medical training and in the first years of clinical practice, given that it can affect young neurosurgeons’ confidence and the awareness of personal strengths and limits. Future research should focus on identifying how external factors may contribute to the development of IS, and additional strategies should be conceived to mitigate its impact.

Maybe the academic environments themselves may inherently scale down the self-perceptions of residents. Perhaps being part of a highly competitive environment devoted to the perpetual progress of medical science might turn out to be an incessant reminder of what is yet to be known, discovered, or improved.

**Study Limitations**

This study has several limitations. First, the cross-sectional design of this study does not allow investigation of a causal relationship between variables. Moreover, a survey by its nature causes respondents to be subjected to the “Hawthorne effect”—i.e., to the fact that there is an alteration of behavior by the subjects of a study due to their awareness of being observed. This factor is acknowledged to be an important source of bias in surveys like ours.\(^16\)

This project is based on anonymity, and the results shown are related to the subjective opinion of each neurosurgeon resident. Personal factors such as stress and/or frustration and other contingent incidents may have altered the answers of the respondents; they could in fact have answered differently on other occasions. Although there was a good response rate, there might be a survey response bias, given that most of the answers came from academic institutions and from young residents.

The prevalence rate is also likely to be affected by the type of respondents, because most of them are either young residents or coming from academic realities, which are two factors that could make them more sensitive to the issue. The literature also suggests that hierarchy in medical education, exacerbated by an academic environment, may perpetuate feelings of IS. On the other hand, in an academic environment, it is easier to organize workshops on IS and to develop mentorship and support programs, factors that have been associated with protection against IS itself.\(^3\)

The CIPS has never been ratified in Italian, despite being cross-culturally validated. To avoid any possible bias, the survey was administrated in both languages (English and Italian). A final limitation could be due to the relatively small number of respondents: such a small cohort may have affected subanalyses.

**Conclusions**

IS is highly prevalent in the population studied, with 81.6% of young neurosurgeons reporting potentially significant levels. The data in our study show that the women and young neurosurgeons more interested in an academic career are more prone to suffer from such a syndrome. The implications of IS on both the outcomes in patients and the well-being of neurosurgeons should be evaluated in future studies, and also a better focus should be placed on subspecialties and various career stages.

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References

Disclosures
The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions
Conception and design: Zaed, Menna. Acquisition of data: all authors. Analysis and interpretation of data: Zaed, Della Pepa, Menna. Drafting the article: all authors. Critically revising the article: Zaed, Bongetta, Della Pepa, Zoia, Somma, Zoli, Raffa. Approved the final version of the manuscript on behalf of all authors: Zaed. Statistical analysis: Zaed, Menna. Study supervision: Zaed, Menna.

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