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Sexual Function and Depressive Symptoms among Male North American Medical Students

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ABSTRACT

Introduction. The role of sexuality as an association of medical student well-being has not been extensively studied.
Aim. We explored the relationship between depressive symptoms, sexuality, and sexual dysfunction in male North American medical students.
Main Outcome Measure. North American medical students were invited to participate in an Internet-based survey. The Center for Epidemiological Studies Depression Scale (CES-D) was utilized to screen for depressive symptoms.
Methods. Subjects completed an ethnodemographic survey, a sexuality survey, and instruments for the quantification of anxiety, sexuality, and psychosocial function. Descriptive statistics, odds ratios (ORs), and logistic regression were used to analyze our data.
Results. There were 844 male subjects with complete data on the CES-D and the Spielberger State-Trait Anxiety Index. Depressive symptoms (CES-D $\geq$ 16) were present in 37% of respondents and were more common in subjects with greater levels of anxiety. Subjects who were in sexual relationships and/or had frequent sexual activity were less likely to be depressed compared to other subjects. Erectile dysfunction (ED) was associated with significantly greater likelihood of depressive symptoms (OR 2.90 and 9.27 for depressive symptoms in men with mild or moderate/severe ED relative to men without ED, $P < 0.01$). After adjusting for ethnodemographic and sexual history factors, ED remained significantly positively associated with depressive symptoms (OR 2.87 and 6.59 for depressive symptoms in men with mild or moderate/severe ED relative to men without ED after adjustment, $P \leq 0.01$). Inclusion of data related to psychosocial/relationship factors in the multivariate model eliminated the significant association between ED and depressive symptoms (OR 1.59 and 2.29 for depressive symptoms in men with mild or moderate/severe ED relative to men without ED after adjustment with the Self-Esteem and Relationship quality instrument, $P > 0.05$), suggesting that psychosocial factors were more strongly associated with depressive symptoms than erectile function.
Conclusion. Healthy sexuality and relationships may be protective against depressive symptoms in medical students. Attention to these factors may enhance medical student well-being. **Smith JF, Breyer BN, Eisenberg ML, Sharlip ID, and Shindel AW. Sexual function and depressive symptoms among male North American medical students. J Sex Med 2010;7:3909–3917.**

Key Words. Erectile Dysfunction; Medical Students; Depression; Premature Ejaculation; Epidemiology

Introduction

The psychological well-being of medical students in training has been a topic of interest for many years. A recent review of psychological morbidity in medical students identified 40 manuscripts published between 1980 and 2005 on this topic [1]. While individual studies have varied in methodology and results, the general consensus has been that depression and anxiety are prevalent among medical students at a rate higher than that observed in the general age-matched population, particularly among students after the first year of training [1].

The underlying cause of psychological stress in medical students has been a subject of speculation.

An obvious hypothesis is that the substantial demands (e.g., time, exposure to death and suffering, ethical dilemmas, and financial expense) placed on medical students exact a toll in terms of psychological morbidity [2]. While this theory has merit and is likely accurate in many cases, it is also apparent that a substantial number of medical trainees have highly motivated "type A" personalities and may therefore be intrinsically at greater risk for psychological stress compared to the general population [3,4]. While cause and effect are difficult to accurately ascertain, there can be little contention that the prevalence of depression and anxiety symptoms in medical students represent a pressing problem in need of attention to maximize student well-being, educational achievement, and possibly patient safety [2,5].

Sexuality is an important facet of overall quality of life; a satisfying a sexual life and/or absence of sexual concerns has been linked to decreased levels of depression and anxiety in many populations [6–9]. Interest in the sexual lives of medical students, both as a factor in their capacity to manage sexuality concerns in the clinical context and for their own personal quality of life, was a topic of particular interest during sexuality curriculum reform that occurred in 1960s American medical schools [10]. The sexual lives of medical students have received scant attention since that time, although a small pilot study suggested that sexual problems were prevalent in contemporary medical students [11]. To our knowledge, there have been no recent investigations on the interplay between psychological and sexual factors in overall medical student quality of life.

The purpose of the current study was to ascertain the prevalence of depression and anxiety in a population of male North American medical students. Furthermore, we sought to examine the interrelationship between sexual function and psychological stress in this population. Finally, we investigated the role that sociodemographic factors play in the psychological and sexual life of medical students. We hypothesized that depression and anxiety is prevalent in this population, and that sexual problems tend to be co-morbid with psychological stress.

Methods

Study Population

Medical students in North American medical schools were invited to participate in an Internet-based survey. Invitations were extended via postings on the American Medical Student Association list-serves, the Student–Doctor Network, and a news story posted on Medscape.com. The survey was available at QuestionPro.com (Survey Analytics LLC, Seattle, WA, USA) and was open for accrual from February 22, 2008 until July 31, 2008. Approval for this study and the survey instrument was granted by the Committee for Human Research at our institution. Implied consent was assumed by subject participation in, and completion of, the survey instrument.

Primary Outcome Measures

Subjects were asked to complete the Center for Epidemiological Studies Depression Scale (CES-D), a 20-item instrument designed to assess presence and severity of depressive symptoms [12]. A CES-D score of 16 was utilized as a cut-off for risk of clinically significant depressive symptoms [13]. A six-item short form of the Spielberger State-Trait Anxiety Index (STAI) was utilized to screen for anxiety symptoms [14]. We elected to divide STAI scores into quartiles for subsequent analysis; cut-off variables for clinically significant anxiety have been developed for the long-form STAI [15] but have not been adequately validated for use with this abbreviated instrument.

Exposure Variables

Sociodemographic and Sexual Experience

The remainder of the survey consisted of a questionnaire that assessed demographic characteristics such as age (continuous), race/ethnicity (Asian, Black, Caucasian, Hispanic, and other), sexual relationship status (yes/no), marital status (married, single, other), prior paternity (yes/no), geographic location (Canada or seven U.S. regions), and year in school (first, second, third, fourth, or research). A sexuality survey assessed variables such as sexual orientation (homosexual/heterosexual/bisexual/asexual/other), age at first intercourse (continuous if any), and number of lifetime/recent partners (continuous), and a questionnaire on which sexual activities the individual had engaged in (yes/no for masturbation, received/performed oral sex, vaginal sex, receptive/insertive anal sex, restraining/being restrained for sexual pleasure, and inflicting/receiving pain for sexual pleasure).

Sexual Quality of Life

Subjects completed the International Index of Erectile Function (IIEF), a 15-item validated

instrument for the assessment of five domains of male sexuality (desire, erectile function, intercourse satisfaction, orgasmic function, and overall satisfaction) [16]. The erectile function domain of the IIEF (IIEF-EF) is derived from six questions of the IIEF (score range 5–30); validated cut-off scores were used to classify erectile dysfunction (ED) of differing severity based on IIEF-EF score (≥26 = no ED, 22–25 = mild ED, 17–21 = mild-moderate ED, 11–16 = moderate ED, and ≤10 = severe ED) [17]. Men also completed the Premature Ejaculation Diagnostic Tool (PEDT), a five-item validated instrument for the assessment of premature ejaculation (PE). The PEDT total score ranges between 0 and 20, with a score of 9 or 10 representing "high risk for PE" and a score of 11+ representing clinically significant PE [18,19]. For the purposes of this analysis all men with PEDT score of ≥9 were considered at risk for PE. Male subjects who were in relationships completed the Self-Esteem and Relationship quality instrument (SEAR). The SEAR consists of a "sexual relationship satisfaction" domain and a "confidence" domain; the confidence domain in turn consists of two subdomains, "self-esteem" and "overall relationship satisfaction." SEAR scores have been previously validated [20].

The sexuality-specific instruments were not designed to assess sexual function in individuals who have not engaged in sexual intercourse; for this reason, subjects who had never engaged in sexual intercourse (as they defined it) were excluded from analyses using these instruments. Furthermore, these instruments were initially developed and validated for use in subjects engaging in heterosexual coitus. At the time of this study, there were no widely used and validated quantitative instruments for the assessment of sexual function in men who have sex with men. To make this study as inclusive as possible, minor modifications to instructions and wording were made to the sexuality instruments so as to maximize their applicability to subjects whose primary means of sexual expression is not heterosexual coitus (i.e., homosexual subjects as well as heterosexual/bisexual subjects who frequently engage in noncoital intercourse). These changes consisted primarily of: (i) removing gender-specific terms for the subject's partner and replacing them with gender-neutral pronouns/nouns and (ii) expanding the scope of what constitutes "sexual intercourse" to include "entering your partner's mouth, vagina, or anus" for the IIEF.

Statistical Analysis

Descriptive statistics (e.g., counts, means, standard deviation [SD]) were used to characterize the study population. We report odds ratios (ORs) and their 95% confidence intervals to estimate the association between subject characteristics and depressive symptoms (CES-D ≥ 16) and anxiety (divided into quartiles). Multivariate logistic regression models were developed with a priori selected predictor variables to assess the relationship between ED and significant depressive symptoms (CES-D score ≥16). The variables for age, race, sexual orientation, prior children, anxiety (STAI divided in quartiles), lifetime sexual partners, monthly sexual frequency, number of sexual partners in the past 6 months, and being in a sexual relationship were included in the primary model. To explore the role that psychosocial factors play in the association between ED and depression, we adjusted for SEAR domains. SEAR scores were rescaled from 1-unit increments to 0.5-SD increments for each individual domain and subdomain so as to improve their interpretability. This adjustment has been utilized by others to analyze clinically significant differences in the medical context [21]. Statistical significance was set at $P < 0.05$ and all tests were two-sided. STATA 10 (Statacorp, College Station, TX, USA) was used for all analysis.

Results

There were a total of 844 male respondents who had complete data for both CES-D and STAI. Mean age was 25.7 years (SD 4.1). Significant depressive symptoms (CES-D ≥ 16) were reported by 310 (36.7%) of the respondents. Ethnodemographic and sexuality-specific characteristics of the population (dichotomized by presence or absence of significant depressive symptoms) are presented in Tables 1 and 2, respectively.

Bivariate analysis for ethnodemographic associations of depressive symptoms are presented in Table 3a. Students between the ages of 23 and 27 years were less likely to endorse depressive symptoms relative to students younger than 22 years. In addition, depressive symptoms were significantly associated with both homosexual orientation and increasing levels of anxiety (in a dose–effect fashion). When examining race, there was a trend toward greater prevalence of depression in men of Asian descent compared to Caucasian men ($P = 0.07$).

Bivariate analysis for sexuality-specific associations of depressive symptoms is presented in

Table 1 Demographic, educational, and psychological characteristics of male subjects (N = 844)

	Overall		No depressive symptoms		Depressive symptoms	
	n	%	n	%	n	%
Age						
≤22	230	27.3	133	57.8	97	42.2
23–25	267	31.7	178	66.7	89	33.3
26–27	164	19.5	110	67.1	54	32.9
≥28	181	21.5	113	62.4	68	37.6
Race						
White	571	70.3	378	66.2	193	33.8
Hispanic	59	7.3	34	57.6	25	42.4
Black	20	2.5	14	70.0	6	30.0
Asian	120	14.8	69	57.5	51	42.5
Other	42	5.2	24	57.1	18	42.9
Year in school						
1	206	24.6	128	62.1	78	37.9
2	230	27.4	142	61.7	88	38.3
3	200	23.8	132	66.0	68	34.0
4	151	18.0	94	62.3	57	37.8
Research year	52	6.2	37	71.2	15	28.9
Married or in a domestic partnership	245	46.0	178	72.7	67	27.4
Have children	68	8.1	48	70.6	20	29.4
Significant depressive symptoms (CES-D ≥ 16)	310	36.7				
Anxiety (quartiles)						
<10 (<25th%)	334	39.6	307	91.9	27	8.1
10–12 (25–50th%)	156	18.5	120	76.9	36	23.1
13–16 (50–75th%)	225	26.7	93	41.3	132	58.7
17+ (75th%+)	129	15.3	14	10.9	115.0	89.2

CESD = Center for Epidemiological Studies Depression Scale.

Table 3b. Being a virgin and having ED were both associated with a greater likelihood of depressive symptoms. In contrast, being in a sexual relationship, having at least one sexual partner over the past 6 months, higher intercourse frequency in the past month, and better scores on the SEAR were all significantly associated with less risk of depressive symptoms. High risk of PE was more prevalent in depressed men but the difference did not attain statistical significance ($P = 0.09$). Individuals who had engaged in vaginal sex had lower odds of significant depressive symptoms (OR 0.6, 95% confidence interval [CI] 0.44–0.81, $P < 0.001$), whereas individuals who had been restrained for sexual pleasure had higher odds of depressive symptoms (OR 1.98, 95% CI 1.03–3.80, $P = 0.04$).

After multivariate adjustment for age, race, sexual orientation, children, anxiety, lifetime sexual partners, sex frequency, number of partners in the last 6 months, and currently being in a sexual relationship, mild ED was associated with nearly a three-fold increase in the odds of significant depressive symptoms (OR 2.9, 95% CI 1.3–6.2, Table 4a) compared to normal erectile function. Moderate/severe ED was associated with greater than a six-fold increase in the odds of significant depressive symptoms (OR 6.6, 95% CI 1.9–22.5). When SEAR was included in the multivariate model, the association between ED and depressive symptoms was lost (Table 4b). In the model including SEAR, each 0.5 SD improvement on the self-esteem (OR 0.7, 95% CI 0.6–0.8) and overall relationship satisfaction (OR 0.8, 95% CI 0.7–0.95) subdomains were associated with significantly lower odds of depressive symptoms. Relative to the lowest quartile of anxiety scores, each successively higher quartile of anxiety scores remained strongly and independently associated with greater odds of significant depressive symptoms (data not shown). No other factors or any specific sexual activities remained significantly associated with depressive symptoms after SEAR was included in the multivariate analysis.

Discussion

The percentage of young male adults (18–40%) in North American countries with CES-D scores greater than 16 has been reported to range between 12 and 24% [22,23]. Although direct comparison is not advisable due to differences in study methods, it is apparent that students in our cohort have a high burden of depressive symptoms compared to normative data. Our findings are in line with prior reports in medical student populations; a study of 634 medical students at a large

Table 2 Sexuality characteristics of male subjects

	Overall		No depressive symptoms		Depressive symptoms	
	n	%	n	%	n	%
Sexual orientation						
Heterosexual	711	84.6	465	65.4	246	34.6
Homosexual	109	13.0	57	52.3	52	47.7
Bisexual	20	2.4	11	55.0	9	45.0
Virgin (have not had intercourse)	116	13.7	60	51.7	56	48.3
In a sexual relationship	543	64.3	386	71.1	157	28.9
Six or more lifetime partners	316	43.9	197	62.3	119	37.7
Sexual partners, last 6 months						
0	61	8.4	29	47.5	32.0	52.5
1	489	67.3	327	66.9	162.0	33.1
2+	177	24.4	117	66.1	60.0	33.9
Sexual frequency in last month (percentile)						
0–1 (<25%)	206	28.5	105	51.0	101	49.0
2–5 (25%–50%)	148	20.5	97	65.5	51	34.5
6–10 (50%–75%)	200	27.7	148	74.0	52	26.0
11+ (>75%)	168	23.3	121	72.0	47	28.0
Premature ejaculation						
No (PEDT < 9)	366	75.6	248	67.8	118	32.2
Yes (PEDT ≥ 9)	118	24.4	70	59.3	48	40.7
Erectile dysfunction						
None (IIEF > 25)	587	86.3	410	69.9	177	30.2
Mild (21–25)	63	9.3	28	44.4	35	55.6
Moderate-Severe (<21)	30	4.4	6	20.0	24	80.0
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
SEAR						
Overall	84.5	12.5	87.9	9.9	76.5	14.2
Sexual relationship satisfaction	82.6	13.5	85.4	11.5	76.0	15.5
Confidence	87.1	13.1	91.3	9.6	77.1	14.8
Self esteem	87.4	14.8	91.8	10.4	76.7	18.1
Relationship satisfaction	86.7	15.1	90.2	12.7	78.3	17.0

PEDT = Premature Ejaculation Diagnostic Tool; IIEF = International Index of Erectile Function; SEAR = Self-Esteem and Relationship quality instrument; Std Dev = standard deviation.

U.S. medical school reported a 33% incidence of depression and/or anxiety in men [24]. These results are similar to our findings and lend credence to our data collection. Numerous studies have reported a prevalence of depression and anxiety similar to the general population in entering medical students [2,25–27], implying that the medical school process may precipitate increased psychological stress.

Depression and anxiety symptoms are important concerns in their own right but are of particular concern in a medical student population as they may impair scholastic aptitude and patient care. Medical students indicate that stress, depression, and anxiety are some of the greatest potential negative influences on their academic performance [28,29]. An objective prospective analysis (with data gathered before and 8 months into the first year of training) reported that academic performance was inversely associated with depression and anxiety at both time points; however, the predictive power of stress was significantly lessened after controlling for pre-medical school academic performance [30]. In a less tangible but no less significant finding, Thomas et al. [31] determined that student psychological well-being and overall quality of life correlates with their capacity for empathy. Medical trainees suffering from depression or anxiety have been shown to "over-diagnose" these symptoms in video-taped patient presentations and are also more prone to medical errors [5,32]. Perhaps most concerning, depressive symptoms have been clearly linked to higher risk of suicidal ideation in medical students [33].

It is evident that both intrinsic and extrinsic factors may contribute to the severity and impact of psychological stress in medical students and that intervention to improve medical student psychological well-being is of value [2,27,34,35]. While generally better positive life factors have been associated with decreased psychological stress [26], we are not aware of any prior studies linking sexuality practices and function as predictors of depression and anxiety in this population. Our

Table 3 Bivariate relationship between sociodemographic and sexuality characteristics, anxiety, and depressive symptoms

A. Sociodemographic characteristics and anxiety as bivariate associations of depressive symptoms

	OR	95% CI		*P* value
Age				
≤22	1.00	ref		ref
23–25	0.69	0.48	0.99	0.04
26–27	0.67	0.44	1.02	0.06
≥28	0.83	0.55	1.23	0.35
Race				
White	1.00	ref		ref
Hispanic	1.44	0.84	2.48	0.19
Black	0.84	0.32	2.22	0.72
Asian	1.45	0.97	2.16	0.07
Other	1.47	0.78	2.77	0.24
Year in school				
1	1.00	ref		ref
2	1.02	0.69	1.50	0.93
3	0.85	0.56	1.27	0.42
4	1.00	0.65	1.53	0.98
Research year	0.67	0.34	1.29	0.23
Sexual orientation				
Heterosexual	1.00	ref		ref
Homosexual	1.72	1.15	2.59	0.01
Bisexual	1.55	0.63	3.78	0.34
Married or in domestic partnership	0.92	0.63	1.35	0.67
Have children	0.71	0.41	1.21	0.21
Anxiety (quartiles)				
<10 (<25th%)	1.00	ref		ref
10–12 (25–50th%)	3.41	1.98	5.86	<0.001
13–16 (50–75th%)	16.14	10.04	25.94	<0.001
17+ (75th%+)	93.40	47.31	184.38	<0.001

B. Sexuality variables as bivariate associations of depressive symptoms

	OR	95% CI		*P* value
Virgin	1.74	1.17	2.58	0.01
Currently in a sexual relationship	0.39	0.29	0.53	<0.001
Six or more lifetime partners	1.27	0.93	1.73	0.13
Number of partners last 6 months				
0	1.00	ref		ref
1	0.45	0.26	0.77	0.003
2+	0.46	0.26	0.84	0.01
Sexual frequency in past month (percentile)				
0–2 (<25%)	1.00	ref		ref
2–5 (25%–50%)	0.55	0.35	0.84	0.01
5–10 (50%–75%)	0.37	0.24	0.55	<0.001
10+ (>75%)	0.40	0.26	0.62	<0.001
Risk of premature ejaculation	1.44	0.94	2.21	0.09
Erectile dysfunction				
None (IIEF-EF >25)	1.00	ref		ref
Mild (IIEF-EF 21–25)	2.90	1.71	4.91	<0.001
Moderate-Severe (IIEF-EF <12)	9.27	3.72	23.06	<0.001
SEAR scores (per 0.5 SD change)				
Total	0.62	0.56	0.70	<0.001
Sexual relationship satisfaction	0.71	0.65	0.79	<0.001
Confidence	0.54	0.48	0.61	<0.001
Self-esteem	0.57	0.51	0.65	<0.001
Relationship satisfaction	0.68	0.61	0.75	<0.001

OR = odds ratio; CI = confidence interval; IIEF = International Index of Erectile Function Domain; SEAR = Self-Esteem and Relationship quality instrument; SD = standard deviation; ref = reference group. Shading added to highlight relationships that were statistically significant ($P < 0.05$).

data indicate that male medical students with good erectile function and/or in relationships appear to have a lower incidence of depression. Those men in relationships who endorse greater confidence and self-esteem within the relationship context appear to be at the lowest risk for depressive symptoms. Indeed, the addition of the SEAR self-esteem domain scores to the multivariable strongly abrogated the association between ED and depression, suggesting that self-esteem is the key factor

Table 4 Associations of depressive symptoms after multivariate adjustment for anxiety and sociodemographic characteristics

A. With adjustment for erectile dysfunction (n = 627)*

	OR	95% CI		*P* value
Erectile dysfunction				
None	1.00	ref		ref
Mild	2.87	1.34	6.15	0.01
Moderate–severe	6.59	1.93	22.54	0.003

B. With adjustment for erectile dysfunction and psychosocial factors (SEAR, n = 460)*

	OR	95% CI		*P* value
Erectile dysfunction				
None	1.00	ref		ref
Mild	1.59	0.56	4.51	0.38
Moderate-severe	2.29	0.42	12.49	0.34
SEAR score (per 0.5 SD change)				
Sexual relationship satisfaction	1.20	0.96	1.50	0.10
Self-esteem	0.69	0.56	0.84	<0.001
Overall relationship satisfaction	0.79	0.66	0.95	0.01

*Adjusted for age, race, sexual orientation, prior children, anxiety, lifetime sexual partners, sexual frequency, number of partners in last 6 months, and current sexual relationship. The model that included SEAR domains excluded men who were not in a current sexual relationship.
OR = odds ratio; CI = confidence interval; SEAR = Self-Esteem and Relationship quality instrument; SD = standard deviation.

in this analysis. Medical students with active sexual lives (whether in a relationship or not) and no evidence of sexual dysfunction are less likely to endorse symptoms of depression and anxiety. While association does not prove causation, it is apparent that relationship status is worthy of consideration when evaluating for depressive symptoms in this population.

Medical educators have made efforts to enhance medical student well-being by providing classes on stress management, workshops on mindfulness, and making counseling services easily accessible with positive results [36–39]. We suggest that attention to maintenance of a healthy sexuality (as defined by the individual's personal sexual mores and beliefs) is another important means by which to enhance overall state of psychological well-being among medical students. In the absence of a clinical trial it cannot be definitively stated that attention to this aspect of life will improve medical student well-being; however, it is an intriguing concept and worthy of further attention by those involved with and concerned for medical student welfare.

Limitations of our data-set include a limited population of respondents that may not be representative of the total medical student body of North America; specifically, Caucasian students were overrepresented and the proportion of male homosexual respondents was over 13% of the total male respondent pool, a proportion that is higher than expected based on normative population data [40]. Furthermore, subjects who are willing to participate in an online sexuality survey may not be representative of the overall medical student population (volunteer bias). The IIEF-EF domain has not been utilized extensively in men not in heterosexual relationships; ergo, IIEF-based findings in our men who were not in relationships should be interpreted cautiously. More importantly, conclusive diagnosis of psychological state and sexual function cannot be definitively gleaned entirely from numeric survey data. This was not a longitudinal study trial so the causality of depressive symptoms from sexual problems cannot be deduced from these data. Finally, the survey was limited in scope and important contributors to psychological/sexual morbidity may have been missed.

Despite these limitations, these data support the notion that psychological morbidity is common in medical students and that it is associated with certain definable sexual issues. Additional research on means and mechanisms to alleviate both psychological and sexual distress in this population is warranted; this may involve providing resources (such as workshops on maintaining healthy psychosocials in medical school, psychosocial counseling, information on sexual health, access to contraceptives, etc.) for students who are struggling with sexuality/intimacy problems.

Conclusions

Psychological morbidity is common in male North American medical students and may lead to problems not just for the individual student but for their social network, colleagues, and patients. Sexuality and intimate relationships are important contributors to overall quality of life for many people; in this population better erectile function and greater confidence in intimate relationships are independently associated with lower risk of depressive symptoms.

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Conflict of Interest: Alan W. Shindel has served as an informal consultant for Boeheringer Ingelheim.

Statement of Authorship

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Category 3

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