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Original article

Suicide in the elderly: a 37-years retrospective study

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Summary. *Background:* The rates of suicide increase with age and reach their highest levels in the oldest age groupings and are sufficiently large for them to constitute a public health concern. The number of deaths due to suicides after the age of 60 years in Italy is 1,775 (41.36%) in 2013; there is a constant increase of elder population over the last ten years and elderly are almost twice of young. It is in this context that suicide arises, a risk factor during old age. *Method*: This is a retrospective study of autopsy and police reports of suicide from January 1979 through December 2015. Data about suicides after the age of 60 years was collected from the Archives of the Legal Medicine of the University of Parma, a Northern Italian city. Trend and characteristics (age, sex, marital status, pathological factors and method of suicide) were assessed. *Results:* A total of 538 cases (394 males, 144 females) were identified. Male sex correlates to a higher suicidal risk, with a male-female ratio of 2.74:1. The highest risk of suicide is observed in the age between 70 and 79 years. Pathological factors were revealed in 427 cases (physical state for 194 cases, mental state for 233 cases); mental illness was related significantly to suicidal risk. Hanging is the most common suicide method (175 cases), followed by fall from height (130 cases), drowning (101 cases) and use of firearms (56 cases); differences regarding methods employed were detected between males and females. The choice of method sometimes is indicative of a clear decision, while other times it is strictly linked to the availability of the means. *Conclusions:* Suicidal behavior seems to be the product of the interaction of many factors, such as biological or psychological diseases or painful events. The presence of chronic and debilitating diseases, often accompanied by profound psychological suffering, is a powerful stimulus for suicide among men, whereas mental state is a significant risk factor for women, with the majority suffering from depression. The psychological and the biological changes, the cognitive deficits and the common diseases facilitate the structuring of depressive characteristics. (www.actabiomedica.it)

Key words: suicides, aged 60 and over, autopsy and police reports, suicide rates, risk factors

Introduction

The suicide death of an older subject is less impactful on the people than the loss of someone younger, particularly of adolescents and of young adults. For these reason, suicide in the elderly population is a phenomenon that is often ignored or neglected, drawing less attention than suicide in younger population.

This may be due to its lower economic impact on society, since most older suicide victims are not in the workforce, and the fact that fewer years of life are lost (1).

The World Health Organization (2) had defined suicide as an act deliberately initiated and performed by a person in the full knowledge or expectation of its fatal outcome. Much discussion took place with regard to definitions, with the ongoing evolution of terms in this field and the use of different terms for very good reasons elsewhere in this sector. Currently, suicide is the act of deliberately killing oneself (3). Every 40

seconds a person dies by suicide somewhere in the world. An estimated 804,000 suicide deaths occurred worldwide in 2012, representing an annual global age-standardized suicide rate of 11.4 per 100,000 population (15.0 for males and 8.0 for females) (3). Suicide is a significant cause of death in many European Union (EU) member states, with approximately 60,000 deaths in 2010-2011 (or nearest year). Suicide mortality rates per 100,000 population vary widely across European countries, with the lowest rates in southern European countries - Cyprus (3.6), Greece (3.0), Italy (5.4), Malta (7.4) and Spain (5.8) - as well as in the United Kingdom (6.4), at eight deaths or less per 100 000 population, and the highest rates in the Baltic States and Central Europe - Estonia (18.3), Hungary (21.7), Latvia (20.7), Lithuania (31.5) and Slovenia (17.2) - where suicide rates, more than 17 deaths per 100,000 population, are more than 50% higher than the EU average. There is more than a ten-fold difference between Lithuania (31.5) and Greece (3.0), the countries with the lowest and highest death rates. Low income, alcohol and drug abuse, unemployment and social isolation are all associated with higher rates of suicide. The number of suicides in certain countries may be under-reported because of the stigma associated with the act (for religious, cultural or other reasons). Comparability of suicide data between countries is affected by a number of reporting criteria, including how a person's intention of killing themselves is ascertained, who is responsible for completing the death certificate, whether a forensic investigation is carried out, and the provisions for confidentiality of the cause of death. Death rates from suicide are four-to-five times greater for men (average rate 20.7) than for women (average rate 4.7) across the EU, although in those countries with the highest rates, male deaths are up to seven times as common. Suicide is also related to age, with young people aged under 25 and elderly people especially at risk and suicide risk also generally increases with age (4). While suicide rates among the latter have generally declined over the past two decades, less progress has been observed among younger people (5).

In spite of mixed trends, suicide remains a significant public health problem worldwide. Potential explanations for cross-national variations in trends over time in elderly suicide rates include cross-national differences in trends over time in the prevalence of mental illness in the elderly, socioeconomic factors, cultural factors, the availability of appropriate healthcare services, and public health initiatives to improve the detection and treatment of mental illness, mental health and suicide prevention (6). Fundamentally, suicide rates in most industrialised nations increase with age, the highest rates of all occurring in elderly men. Risk factors for elderly suicide are: older age, male gender, living alone, bereavement (especially in men), psychiatric illness (depression, alcohol misuse, previous suicide attempt, vulnerable personality traits), physical illness (pain) (7).

The absolute number of deaths due to suicides in Italy - data based on a population of 60,782,668 residents - is 4291 (3323 for men and 968 for women) in 2013, with low death rate (6.6) per 100,000 population; amongst all cases, 1,775 are suicides after the age of 60 years (41.36%) (8). In the last 50 years we have witnessed a gradual increase in life expectancy and a simultaneous decrease in birth, which had led to population aging in a context of a capitalist and consumerist system that changed the imagine and role of the elderly, in society and in the family context as well. In our culture and social structure, productivity and work are fundamental elements in defining identity and social role. The onset of old age, often signaled by retirement (the transition from adulthood to old age, calls for time of rest), which implicitly coincides with a gradual placement in a marginal context. The world of relationships shrinks, interest in the outside world weakens, and the ritualization of everyday life and conservatism predominate (9). In this context, feelings of worthlessness, emptiness, lack of prospects or resources arise, and the elderly are not always to counter them with new objectives and interests. Rapid cultural changes, constant research and scientific success have made it possible to achieve results that a century ago were considered unreachable, with the increase of life expectancy because of better health care. Nevertheless, the extra years of life achieved do not necessarily provide a better quality of life; the increase of chronic diseases and the loss of physical strength often lead to feeling of worthlessness, anxiety for the future, lack of prospects or resources, until depression. To contribute

to the arising of these feelings there is also the changing of 'traditional' family, always ready to cure and care their elderly, with a 'new' one, in which, because of the importance of productivity and work, all the members are always busy with fewer and fewer time to dedicate to the weak part of the family. All these factors contribute to make the elderly feeling a burden for their own family and society.

It is in this context that suicide arises (10), a risk factor during old age. This retrospective study, conduced in a Northern Italian province where a high percentage of people reach the old age, sets out to analyze the characteristics of suicide and identify the variable that seem more specifically related to an increased risk of suicide (11).

Materials and methods

We retrospectively reviewed all cases referred to the archives of Legal Medicine of the University of Parma (Parma is a city in the Italian region of Emilia-Romagna, Northern Italy; it is home to the University of Parma, one of the oldest universities in the world, founded in the 12th century [1117 A.D.]; the schools of law and medicine were added in the 13th century). The study was conducted by examination of autopsy and police reports of all cases of suicides after the age of 60 years, a total of 538 cases (394 male cases and 144 female cases) during the 37-years period examined, between 1 January 1979 and 31 December 2015. These reports were often based on circumstantial information and personal testimony, especially the details provided by family members: for this reason, some of them are very accurate, while some others are approximate and incomplete, in particular the alleged motivation for suicide, subjected to the emotional conditioning and interpretations of people involved. Several autopsy records lack details since they only mention basic diagnostic findings. Information taken from each report were collected based on the following parameters: age, sex, marital status, pathological factors (physical state, mental state), method of suicide. The survey conducted and the analysis of such variables are purely statistical and intended to provide descriptive information about the phenomenon of suicide from which guidelines for interpretation may be drawn to further enhance the understanding and the possible prevention of suicide among the elderly.

Results

Analyzing the 538 cases during the 37-year period examined, the highest risk of suicide appears to be in men with 394 cases (73.23%) with respect to 144 cases (26.77%) of female suicides, showing a male-female ratio of 2.74:1. The figure of suicides annually occurring indicate that a higher number of female suicides was recorded only in 1983 and in 1986, 10 cases (50.00%) respectively; before and after such years, the distribution is constant over time, except for zero cases in 2015. Rates of male suicide have a much higher percentage of cases and records show two peaks: one in 1987 (23 cases) and another one in 2002 (20 cases); the years 1979 and 2015 show the lowest rates (3 cases, respectively). Of all the cases, three peaks were observed in 1987 (30 cases), 1988 and 2002 (24 cases, respectively), while 2015 (3 cases) show the lowest rate**.** However, it must be noted that there is a declining suicide trend in the last years.

By age, the most affected group appears to be between 60 and 69 years until 1990; from that moment on, the highest risk of suicide is observed in the age between 70 and 79.

The marital status is known only for 218 individuals (40.51% of the sample), married individuals (129 cases, 23.97%) and widows/widowers (89 cases, 16.53%). Dividing the data by gender, it is interesting to note that the state of being married is not a deterrent for male suicidal behavior (110 cases, 20.44%).

Review of medical and psychiatric histories revealed a pathological factor in 427 cases, physical state for 194 cases (45.43%) and mental state for 233 cases (54.57%). In reconstructing the motive of suicide, physical state is predominant in men (123 cases, 63.41%), whereas the mental state proves to be more significant for women (150 cases, 64.37%).

Hanging is the most common suicide method (175 cases, 32.52%), followed by fall from height (130 cases, 24.16%), drowning (101 cases, 18.77%) and use of firearms (56 cases, 10.40%). Other methods con-

sist of poisoning (30 cases, 5.57%), edge weapon (21 cases, 3.90%), train impact (15 cases, 2.78%), immolation (5 cases, 0.92%), asphyxia by confinement (4 cases, 0.74%) and self strangulation (1 cases, 0.24%). Hanging is the method most frequently used by men (150 cases, 27.88%), followed by drowning (85 cases, 15.79%). Fall from height is the leading method of suicide in women (61 cases, 11.34%), followed by hanging (25 cases, 4.64%). Firearm is a method mostly chosen by men (50 cases, 9.29%, against 6 female cases, 1.11%).

The characteristics of the specific variables are illustrated in table 1, 2, 3 and 4.

Table 1. Suicide mortality rates from January 1979 through December 2015

Year	Nr. of cases	M:F ratio	Male nr. (%)	Female nr. (%)
1979	9	1:2	3 (33.33%)	6 (66.67%)
1980	9	2:1	6 (66.67%)	3 (33.33%)
1981	8	2:1	5 (62.5%)	3 (37.5%)
1982	9	2:1	6 (66.67%)	3 (33.33%)
1983	20	1:1	10 (50%)	10 (50%)
1984	13	1:1	7 (53.85%)	6 (46.15%)
1985	15	4:1	12 (80%)	3 (20%)
1986	20	1:1	10 (50%)	10 (50%)
1987	30	3,3:1	23 (76.67%)	7 (23.33%)
1988	24	2:1	16 (66.67%)	8 (33.33%)
1989	17	3:1	13 (76.47%)	4 (23.53%)
1990	9	2:1	6 (66.67%)	3 (33.33%)
1991	20	3:1	15 (75%)	5 (25%)
1992	21	3:1	16 (76.19%)	5 (23.81%)
1993	15	3:2	9 (60%)	6 (40%)
1994	17	4,6:1	14 (82.35%)	3 (17.65%)
1995	21	6:1	18 (85.71%)	3 (14.29%)
1996	17	1,5:1	10 (58.82%)	7 (41.18%)
1997	10	2:1	7 (70%)	3 (30%)
1998	16	3:1	12 (75%)	4 (25%)
1999	14	6:1	12 (85.71%)	2 (14.29%)
2000	16	2:1	11 (68.75%)	5 (31.25%)
2001	15	4:1	12 (80%)	3 (20%)
2002	24	5:1	20 (83.33%)	4 (16.67%)
2003	18	5:1	15 (83.33%)	3 (16.67%)
2004	8	2:1	5 (62.5%)	3 (37.5%)
2005	20	6:1	17 (85%)	3 (15%)
2006	15	4:1	12 (80%)	3 (20%)
2007	10	9:1	9 (90%)	1 (10%)
2008	14	6:1	12 (85.71%)	2 (14.29%)
2009	13	5:1	11 (84,61%)	2 (15.39%)
2010	11	10:1	10 (90.90%)	1 (9.10%)
2011	11	3:1	8 (72.73%)	3 (27.27%)
2012	8	2.1	5 (62.5%)	3 (37.5%)
2013	10	4:1	8 (80%)	2 (20%)
2014	8	3:1	6 (75%)	2 (25%)
2015	3	3:0	3 (100%)	0 (0%)
Total cases	538	2,74:1	394 (73.23%)	144 (26.77%)

Discussion

The analysis of the 538 cases during the 37-year period examined, with reference to a limited territory - being only indicative results not generalizable to other districts - provides us with a uniform basis without variables that could complicate understanding the phenomenon of suicide.

Sex

There is a highest risk of suicide in men during the considered period, except for 1979, with a male-female ratio of 2.74:1. It should be noted that this is not as surprising as it might appear at first, since the rate of suicide for women has long been known to decline after age 60. One explanation of higher suicide among men than women - also among the elderly - could be that women have acquired a greater ability to adapt, the presence of a longer lasting social network and the ability of being able to look after themselves (managing a household) in small everyday matters. These stimuli may act as an emotional reinforcement against feelings of worthlessness and for self-esteem.

Age

Suicide rates increase with age and reach their highest levels in the oldest age groupings. There is a shift in the age group affected, between the age of 60 and 69 until 1990 and between 70 and 79 in the 1991-2015 period. The reason for the increase of suicide in that specific age group could simply reflect the increase of life expectancy and hence the presence of an ongoing rise in the elderly population size. Parma is a city with a high quality of life, therefore a high percentage of people reach the old age. There was a constant increase of elder population over the last ten years, simi-

Table 2. Socio-demographic characteristics

	Total number	% of total nr.	M:F ratio	Male nr. (%)	Female nr. (%)
Age (years)					
60-69	191	35.50%	2.29:1	133 (24.72%)	58 (10.78%)
70-79	215	39.96%	3.21:1	164 (30.1%)	51 (9.5%)
80-89	99	18.41%	5.18;1	83 (15.42%)	16 (2.96%)
90 and over	33	6.13%	0.74:1	14 (2.60%)	19 (3.53%)
Total cases	538	100.00%	2.73:1	394 (73.23%)	144 (26.77%)
Marital status					
Married	129	23.97%	5.78:1	110 (20.44%)	19 (3.53%)
Widow/er	89	16.54%	1.28:1	50 (9.29%)	39 (7.24%)
Total cases	218	40.51%	2.75:1	160 (29.73%)	58 (10.77%)

Table 3. Pathological factors

	Physical factors	Mental factors
Pathological factors: total cases		
427	194 (45.43%)	233 (54.57%)
	Male number (%)	Female number (%)
Physical state: total cases		
194	123 (63.41%)	1 (36.59%)
	Male number (%)	Female number (%)
Mental state: total cases		
233	83 (35.63%)	150 (64.37%)

Table 4. Methods

Methods	Total cases (%)	Male number (%)	Female number (%)
Hanging	175 (32.52%)	150 (27.88%)	25 (4.64%)
Fall from height	130 (24.16%)	69 (12.82%)	61 (11.34%)
Drowning	101 (18.77%)	85 (15.79%)	16 (2.98%)
Firearm	56 (10.40%)	50 (9.29%)	6 (1.11%)
Poisoning	30 (5.57%)	10 (1.86%)	20 (3.71%)
Edge Weapon	21 (3.90%)	15 (2.77%)	6 (1.13%)
Train Impact	15 (2.78%)	7 (1.30%)	8 (1.48%)
Immolation	5 (0.92%)	4 (0.72%)	1 (0.20%)
Asphyxia by confinement	4 (0.74%)	3 (0.56%)	1 (0.18%)
Self strangulation	1 (0.24%)	1 (0.24%)	0 (0,00%)
Total cases	538 (100%)	394 (73.23%)	144 (26.77%)

larly than in the whole Italy. Elderly are almost twice of young and represent the 23% of the entire population, while under 18 years old are just 14%; median age is 46 years. There were 172,8 elderly every 100 young people in 2015 (12), and this trend is expected to continue, accelerating even more in the future. With the increase of life expectancy the retirement age rises, with people working longer; nowadays, retirement is possible at 70 years old, while previously at 60. Retirement age, nonetheless, often overlaps the beginning

of the decrease of psychophysical abilities and loss of independence (13).

Another explanation could be that emotions tend to change both in terms of quantity and quality in old age. Subjective intensity decreases towards content that in the past provoked intense reactions; emotions concentrate around specific issues, especially physical and psychological wellbeing and socio-economic status. The examination of the data shows that the age of 70 is when aging proves to be the most difficult. Psychophysical abilities decrease, the elderly individual becomes more vulnerable and in need of more support and assistance. It therefore becomes harder to find one's own place and give new meaning to the concept of life; the increase of suicide in this age group demonstrates this fragility.

Marital status

The marital status (married individuals, widows/widowers) is known only for 218 individuals (40.51% of the sample) and could not be representative of the sample in our study model. State of being married does not appear to be a protective factor, but its impact on suicide differs by sex and men are at a higher risk of suicide while still married. It appears that when faced with feelings of worthlessness, loss, cognitive decline and gradual loss of independence (14) men slip into social isolation, which makes it difficult for them to ask for assistance. In these circumstances, a depressive-aggressive mechanism (15) is enacted: each loss is experienced with pain, but also anger; death in this circumstance removes the individual from a difficult condition while also being a cleansing, remedial catharsis. On the other hand, widowhood proves to be a decisive factor for women(16) because the disintegration of the marital unit initially causes admitting pain and intense support of family and friends. With time passing by, this support network weakens, and the individual finds herself in a decidedly solitary state. Women turn in on themselves, and this state of isolation gives rise to feelings of emotional emptiness and uselessness. The deep-seated rift or suffering finds no other answer but in death.

Between social factors implicated in suicide risk for older adults, living alone also appears to increase risk of attempt and completion (17, 18).

Physical state

Physical status, intended here as the presence of chronic and debilitating diseases, often accompanied by diversity in social relations and social participation (19) and by serious psychological suffering, proved to be a powerful motive for suicide, especially among men. In this case, death may be interpreted as liberation from an unbearable state (20). In this context, the idea of death seems almost "rational" when faced with a future of unbearable suffering and humiliating forms of dependence. This issue was addressed in a study by the University of Parma's Department of Psychiatry, which analyzed the method of psychological autopsies for 99 suicide cases, 77 men and 22 women, between 1994 and 2004. The study confirmed the correlation between elderly suicidal behavior and somatic diseases, especially cancer and cardiovascular diseases, diagnosis that accounted over 45% of the cases studied. Although more than 50% of older suicides were diagnosed as DSM-IV-TR depressed, only 20%-30% of them had been treated with medications (21). This result is confirmed by our study that show physical disease as predominant motive for suicidal behavior in men (63.41%), death as liberation from physical suffering.

The presence of physical illness should not detract from a close examination of the mental state, with particular regard to a coexistent depressive illness and associated suicidal feelings. Hypochondriacal and somatic symptoms may mask the underlying depression. This form of presentation of depression may be of particular importance in elderly men, who may be less likely to verbalise depressed mood or admit to have suicidal thoughts. Suicidal ideation and pessimistic thoughts are not uncommon among severely medically ill and continuing-care geriatric in-patients, necessitating staff training in these facilities in the recognition and treatment of underlying disorders (22, 23).

Mental state

While reconstructing in our study the motive of suicide, the review of psychiatric histories revealed a mental state predominant in women (64.37%), with the majority of them suffering from depression. De-

pression and many other psychiatric disorders are a significant risk factor for suicide in the elderly. But depression rarely leads to suicide by itself. Physicians must be aware that the concomitant presence of depressive symptoms and several life events (especially loss and loneliness in women and physical illness in men) should be considered warning signs for suicidal behavior (21). Among depressed suicide cases aged 60 and over years with a primary diagnosis of depression, a comorbid anxiety disorder was associated with a higher prevalence of several suicide risk factors (24).

Aside from documented cases of psychiatric diagnosis, informational reports attached to autopsy records frequently refer, and superficially so, to "depression", a term often used inappropriately. In fact, depressive disorder is rarely recognized in old age because psychological changes, inevitable age-related biological changes, cognitive deficits and frequent overlapping of neurological or internal diseases give rise to a different expression of depressive symptoms. In addition to traditional symptoms (25), the psychological symptoms of depression seem to be less common among the elderly, that are sadness, sense of guilt and sense of failure. Depressive distress may be dominated by symptoms of general anxiety, palpitations, lump in throat feeling, complaints of nervousness or irritability, psychomotor agitation, restlessness, obsessive ideation and akathisia. In other cases, cognitive symptoms, such as poor attention and concentration, memory loss and other orientation problems, dominate the clinical picture. A series of somatic symptoms are often part of elderly depression and are often accentuated by the patient. The most reported ones are fatigue, vague gastrointestinal discomfort, headaches, insomnia, weight loss, constipation and hypochondriacal worries. These characteristics make it difficult to diagnose depression as well as to make a diagnosis that differentiates between dementia and depression (26). If aging is viewed as a process of change, then investigating the sphere of emotions is important because alterations in psychophysical functions connected to a state of uncertainty and frustration are indicators of actual suffering. On one hand, they may prove to be signs of decathexis and loss that correspond with actual events of loss (health, status, profession, friendships); on the other hand, they may be indicators of marginalization and anxiety that put the elderly on the road towards death. In fact, the elderly individual reacts not only to mostly inevitable external conditions, but also to internal changes that indicate a new mental core (27).

Method of suicide

The act of suicide among the elderly is premeditated; it is a rather slow progression from suicidal thoughts to committing suicide and is not an impulsive act. The choice of the method of self-destruction is conditioned by different kinds of factors: the availability and accessibility of the method, the impact of imitative factors, and society's collective image of each method. This age group uses more violent and lethal means of committing suicide than those used by other groups, especially younger persons, which confirms the high level of determination that underlies the gesture.

The elderly individual is much more fragile and therefore less likely to survive physical injury. For this reason, less lethal methods should not be underestimated and, indeed, may result as equally effective. In this study, 85.85% of the suicides are hanging (32.52%), fall from height (24.16%), drowning (18.77%) and use of firearms (10.40%). Poisoning, edge weapon, train impact, immolation, asphyxia by confinement and self strangulation accounts for only 14.15% of the cases. Hanging is the most common suicide method in men (27.88%) followed by drowning (15.79%); fall from height is the leading method in women (11.34%) followed by hanging (4.64%). Hanging is a fast, certain and relatively painless method: since it requires a certain amount of organization, it demonstrates the high level of premeditation involved in this kind of suicide. On the opposite, fall from height is a choice that requires no organization, rather effective and easily accessible. Firearm is a method mostly chosen by men (9.29%) in comparison with women cases (1.11%), due to the greater knowledge needed of how the method works and the dramatic disfigurement caused by a firearm; culturally, it appears that women refuse this type of disfigurement. The number of men that used firearms shows a progressive increase after 1990, becoming the first method after 2010.

Conclusions

For the risk factors identified in this study we confirm that suicidal behavior after the age of 60 years is the product of an interaction of many antecedents factors, such as physical or psychological chronic diseases or painful events and social factors at a crucial moment in the life of a vulnerable individual. The elderly individual's inability to cope with suffering and a deteriorating mental and physical state often leads him or her to the belief that there is no other solution but suicide.

Elderly people reporting suicidal feelings presented markedly higher levels of physical and psychological distress, such as depression, anxiety, and hostility. Results implicitly confirm that depressive symptomatology is not adequately treated. Greater attention is warranted in psychological evaluation of the elderly to take into account those risk factors that, if properly identified and managed, could reduce the frequency of suicidal thoughts and, probably, associated actions (28).

Suicide in the elderly is associated with multiple risk factors, most of which can be identified, and are preventable with specific preventive strategies and research. Treatment of depression is an important measure of suicide prevention among the elderly and the European Pact for Mental Health and Well-being, launched in 2008, recognized the prevention of depression and suicide as one of five priority areas. It called for action through improved training of mental health professionals, restricted access to potential means for suicide, measures to raise mental health awareness, measures to reduce risk factors for suicide such as excessive drinking, drug abuse and social exclusion, and provision of support mechanisms after suicide attempts and for those bereaved by suicide, such as emotional support helplines (29). Suicide rates can play an important role in signaling weaknesses of mental health systems, in particular unmet needs for care (30).

Conflict of interest: None to declare

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