



## Mental-health, coping and support following adverse events on the work-floor : a cross-sectional study among Dutch orthopaedic surgeons

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Physicians are frequently exposed to adverse events on the work-floor, which puts them at risk for depression, anxiety- or posttraumatic stress disorder. This study aims to explore what events orthopaedic surgeons consider to have the highest emotional impact as well as support, coping strategies and mental health.

A questionnaire was emailed to all members of the Dutch Society of Orthopaedic Surgeons which included resident, attending, non-practicing and retired orthopaedic surgeons. The questionnaire included questions about demographics, personal experiences and subsequent support and coping. Also the Hospital Anxiety and Depression Scale and the Trauma Screening Questionnaire were included, which are validated screening instruments for anxiety, depression and posttraumatic stress disorder (PTSD), respectively.

A total of 292 questionnaires were eligible for analysis. Most common events considered a high emotional impact stressor were : missing a diagnosis (59.2%), when a patient becomes severely handicapped (36.6%) or doubting whether one is making the right decision (36.6%).

The prevalence of depression was higher compared to the general population with a high income in the Netherland (4.8 vs. 3.0 %,) and for anxiety as well (8.3 vs. 6.0%). Fifty-seven (19.5%) participants experienced an adverse event as traumatic. Prevalence of PTSD was 0.3% among the whole sample.

Most common coping strategies after adverse events were support from colleagues (80.7%), support from friends and family (59.3%) or doing sports (26.6%).

Orthopaedic surgeons are exposed to many adverse events over the course of their career, which may

have a high emotional impact. The prevalence rate found for depression and anxiety were both higher compared to the general population, while the rate for PTSD was lower. Still, more awareness must be created for the mental health of physicians as well as the implementation of a well-organized support system.

**Keywords :** Mental health ; physicians ; orthopaedic surgeons.

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### INTRODUCTION

Physicians are frequently exposed to a variety of adverse events on the work-floor, such as life-and-death situations, complications, patient violence and complaints to the disciplinary board. All of these

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situations require adequate coping mechanisms, or essentially a good mental health (10). A good mental health is described in the CanMEDS (10) framework, a framework that defines the seven roles of an adequate physician. In the revised edition of the CanMEDS framework, extra emphasis has been put on this subject, stating that physicians must take responsibility for their own health and wellbeing and that of their colleagues (10).

Studies suggest that an unfit physician potentially poses a threat to patients (6), as this is associated with medical errors (20), decreased productivity and thus higher collateral costs (8).

Depression is a common affective disorder that is characterized by a depressed mood and/or loss of pleasure that lasts for at least two weeks along with other minor criteria such as sleep disturbances, fatigue, eating and weight disturbances, feelings of guilt or worthlessness, difficulty concentrating and suicidality (1). A review in Europe describes a one-year prevalence of 6.9% in the general population (22). The one-year prevalence in the U.S.A. is estimated at 7% (1) and the Nemesis-2 study (7) describes a one-year prevalence of 3.0% among Dutch citizens with a high income.

Anxiety disorders include many different disorders, ranging from a specific phobia to a generalized anxiety disorder. The one-year prevalence for anxiety disorders in the Netherlands is 6.0% among citizens with a high income and 14.5% among citizens with a low income (20).

Unfortunately most research regarding prevalence rates of depression and anxiety among physicians do not differentiate between orthopaedic surgeons and general surgeons, meaning that there is currently no data available regarding psychiatric disorders among orthopaedic surgeons specifically. It is possible that orthopaedic surgeons compared to general surgeons have different prevalence rates for depression, anxiety or PTSD, as work-content differs between the two. However, a study carried out in Germany did show that prevalence of depression was lowest among surgical physicians, despite perceiving the most occupational stress compared to other specialisms (3).

In a study carried out in the Netherlands in 2012, the prevalence of depression and anxiety symptoms

among 423 physicians (of different specialisms) were 29% and 24%, respectively (16).

Posttraumatic stress disorder (PTSD) is a mental disorder that a person can develop after exposure to an adverse or traumatic event. The pathophysiology of this disorder first became apparent among war-veterans, where it affected 30% of soldiers exposed in Vietnam and 50% of prisoners of war and concentration camp victims. This was much higher compared to the general population, where the lifetime prevalence is 10% for women and 5% for men (25). This finding suggested the relationship between traumatic events experienced during war and the development of PTSD.

The Diagnostic and Statistical Manual of Mental disorders 5<sup>th</sup> edition (1) describes this disorder by means of eight criteria. Criterion A, the main criterion, includes exposure to (threatened) death, injury or violence. This could be a direct experience or indirect by witnessing an event as well as learning such events occurred to close family or friends. New in the DSM-5, as opposed to the 4<sup>th</sup> edition, is that repeated exposure to details of adverse events (such as the smell or the screaming from the emergency ward) was added to this list as a possible cause of PTSD, implying that medical staff is at risk for developing PTSD. A study from 2012 confirmed this and stated chronic stress and critical incident stress are both significant predictors for developing PTSD (6).

The other criteria (B to H) include the presence of one (or more) intrusion symptoms, persistence of avoidance of stimuli related to the (traumatic) event, alterations in cognition or mood and negative alterations in arousal or reactivity. In order to distinguish this disorder from an Acute Stress Disorder, symptoms have to be present for at least one month and disturbances must significantly cause impairment in daily life.

Nowadays there is more awareness of physicians being at risk for developing PTSD due to repeated exposure to details of adverse events. This results in a shift in research : focusing on the mental health of physicians instead of solely on patients. This phenomenon is also described by the term 'second-victims', where the health care provider can be traumatized by the event (21). Prevalence of second

victims is said to vary between 10.4% and 43.3% in both surgical and non-surgical physicians (17).

Not much is known about coping strategies among physicians, although Gold et al. reported that physicians most commonly seek support from their peers (11). In 2014, researchers of this current study performed a similar exploratory study among gynaecologists in the Netherlands on the subject of adverse events, coping and support. Outcomes of the study inspired the creation of a national 'Committee of peer-support' (2,26), who offer support regarding dealing with emotional events.

Ideally the current study is to be expanded to explore whether a similar committee is desired in other specialisms as well.

## MATERIALS AND METHODS

This study used the membership database of the Dutch Society of Orthopaedic Surgeons (NOV), which contains contact details of all 1210 resident, attending, retired and non-practicing orthopaedic surgeons in the Netherlands. Each physician received one invitation for an online questionnaire and two reminders over an 8-week period. The questionnaire was sent through SurveyMonkey, creating an anonymous untraceable e-mail link that was distributed by the NOV among its members. Demographic variables of the whole database were provided by the NOV, which served as a reference group.

The questionnaire consisted of 52 questions, including demographic data, personal experiences on the work-floor and questions about support and coping. Regarding the latter, multiple-choice options were given as well as an 'other' field where respondents were able to add their individual answers or comment on their experience.

Furthermore, the questionnaire included the Dutch version of the validated screening instruments Hospital Anxiety and Depression Scale (HADS) (24) and the Trauma Screening Questionnaire (5) (TSQ). The HADS is a 14-item screening instrument for depression and anxiety, where both subscales contain seven questions each. The cut-off value of the Dutch version of the depression (HADS-D) or anxiety subscale (HADS-A) is equal to or bigger

than eight and the combined cut-off value for depression and anxiety is bigger than 12 (24). The combined score corresponds to clinically relevant psychological distress (18). The TSQ is a 10-item screening instrument corresponding to a provisional diagnosis of posttraumatic stress disorder (PTSD) and has a cut-off value equal to or bigger than six (5). Only respondents who answered 'yes' to experiencing a traumatic event at least four weeks ago were to fill out the TSQ.

A translated version of all the questions in this questionnaire can be found in appendix A.

Statistical analysis was performed using IBM Statistical Package for the Social Sciences (SPSS) version 22.

Categories for open answers were created by MVP and LS and were subsequently scored by MVS and KS independently. The overall inter-rater agreement was calculated with Cohen's kappa ( $\kappa$ ).

Demographic data, multiple-choice questions were analyzed using descriptive statistics and exported as frequency tables and bar charts.

Differences in outcomes (in various groups) for categorical variables were tested using either a Chi-squared test or a Fisher's exact test where appropriate. A Mann-Whitney U test was performed to analyze mean outcomes of the HADS and TSQ between practicing (resident and attending) and non-practicing (other job and retired) respondents.

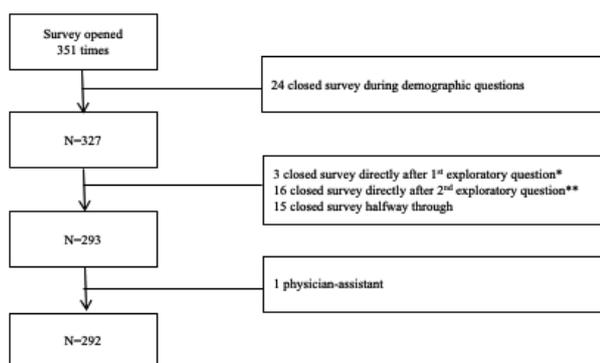
A two-sided p-value less than 0.05 was considered statistically significant.

## RESULTS

A total of 351 questionnaires were collected, creating an overall response rate of 29%. A total of 292 questionnaires were eligible for analysis, as shown in figure 1. There was one physician-assistant who completed the questionnaire, but was later excluded as this study focused specifically on physicians.

The sample is a good representation of the NOV-population apart from the 'non-practicing' subgroup, which is a small subgroup. Demographics and subgroup characteristics are shown in table I and II.

The majority of the respondents were male (85.6%). This was similar in all subgroups. The



\* 1<sup>st</sup> exploratory question: What do you perceive as an adverse on the work-floor?  
 \*\* 2<sup>nd</sup> exploratory question: How do you cope with such adverse events?

Figure 1. — Exclusion overview.

median age was between 40-49 years and the median years in practice was between 11-15 years.

The overall inter-rater agreement, on scoring of the categories of the explorative questions, was substantial to almost perfect, where most Cohen's kappa scores ( $\kappa$ ) were above 0.61.

Outcomes of the HADS are shown in tables III and IV. Fourteen (4.8%) respondents scored above the cut-off value for depression and 24 (8.3%) for anxiety. Thirty-five (12.0%) respondents scored above the cut-off value of the combined HADS. When comparing practicing (resident & attending) with non-practicing (retired or other job) respondents, practicing physicians had significantly higher means in scores for depression ( $2.62 \pm 2.52$  vs.  $1.76 \pm 1.79$ ,  $p=0.032$ ), anxiety ( $3.95 \pm 2.55$  vs.  $2.78 \pm 2.25$ ,  $p=0.001$ ), and combined anxiety and depression ( $6.56 \pm 4.58$  vs.  $4.53 \pm 3.59$ ,  $p=0.002$ ), table IV.

Four respondents (1.4%) reported to have been diagnosed with PTSD earlier in their life. Fifty-seven respondents (19.5%) reported having experienced at least one traumatic event on the work-floor at least four weeks ago. Among those, 35 did not describe the traumatic event. The other 22 descriptions were all applicable and work-related, ranging from severe complications or death of a patient to patient-violence or stress due to complaints to the disciplinary board. The majority mentioned either death of a patient ( $n=9$ ) or severe complications following a procedure ( $n=7$ ). Twenty-five respondents (out of the 57 respondents

Table I. — Baseline characteristics

	Respondents N=292	Population (NOV) N= 1210**
<b>Gender</b>		
Male	250 (85.6)	1038 (85.8)
Female	42 (14.4)	172 (14.2)
<b>Position</b>		
Resident	61 (20.9)	258 (21.3)
Attending physician	182 (62.3)	776 (64.1)
Retired	39 (13.4)	171 (14.1)
Non-practicing	10 (3.4)	5 (0.4)
<b>Age (in years)</b>		
20-29	15 (5.1)	20 (1.7)
30-39	91 (31.2)	430 (35.5)
40-49	57 (19.5)	315 (26.0)
50-59	60 (20.5)	209 (17.3)
60-69	52 (17.8)	156 (12.9)
$\geq 70$	17 (5.8)	80 (6.6)
<b>Years in practice</b>		
$\leq 5$	35 (12.0)	
6-10	57 (19.5)	
11-15	41 (14.0)	
16-20	39 (13.4)	*
21-25	27 (9.2)	
26-30	42 (14.4)	
$>30$	51 (17.5)	
<b>Complaints at disciplinary board</b>	87 (29.8)	*

All values shown as : n (%). \* value unknown. \*\* population as per 06-06-2016.

who experienced at least one traumatic event) also recognised the PTS-symptoms from an earlier time in their life.

Only one person (0.3% of all respondents), an attending, screened positive for PTSD by means of a TSQ score above the cut-off value (table III).

Respondents reported the following events (table V) as high emotional impact stressors : missing a diagnosis (59.2%), when a patient ends up severely handicapped (36.6%), doubting whether one's making the right decision (36.6%), the death of a patient (26.7%) and bad news conversations (16.8%).

Eighty-seven respondents (29.8%) reported having faced a complaint from the disciplinary board. This increased with progression of position (i.e. resident – specialist – retired), as can be seen in table II.

Table II. — Baseline characteristics in subgroups (2)

	<b>Total (n=292)</b>	<b>Resident (n=61)</b>	<b>Attending (n=182)</b>	<b>Retired (n=39)</b>	<b>Non-practicing (n=10)</b>
<b>Gender</b>					
Male	250 (85.6)	43 (70.5)	161 (88.5)	39 (100.0)	7 (70.0)
Female	42 (14.4)	18 (29.5)	21 (11.5)	0 (0)	3 (30.0)
<b>Age (in years)</b>					
20-29	15 (5.1)	15 (24.6)	0 (0)	0 (0)	0 (0)
30-39	91 (31.2)	44 (72.1)	44 (24.2)	0 (0)	3 (30.0)
40-49	57 (19.5)	1 (1.6)	56 (30.8)	0 (0)	0 (0)
50-59	60 (20.5)	1 (1.6)	57 (31.3)	2 (5.1)	0 (0)
60-69	52 (17.8)	0 (0)	24 (13.2)	21 (53.8)	7 (70.0)
≥70	17 (5.8)	0 (0)	1 (0.5)	16 (41.0)	0 (0)
<b>Years in practice</b>					
≤ 5	35 (12.0)	31 (50.8)	2 (1.1)	0 (0)	2 (20.0)
6-10	57 (19.5)	28 (45.9)	28 (15.4)	0 (0)	1 (10.0)
11-15	41 (14.0)	1 (1.6)	40 (22.0)	0 (0)	0 (0)
16-20	39 (13.4)	0 (0)	39 (21.4)	0 (0)	0 (0)
21-25	27 (9.2)	0 (0)	25 (13.7)	2 (5.1)	2 (20.0)
26-30	42 (14.4)	1 (1.6)	29 (15.9)	10 (25.6)	2 (20.0)
>30	51 (17.5)	0 (0)	19 (10.4)	27 (69.2)	5 (50.0)
<b>Complaints at disciplinary board</b>	87 (29.8)	1 (1.6)	58 (31.9)	25 (64.1)	3 (30.0)

All values shown as : n (%).

Table III. — Mental health – Outcomes validated instruments (HADS+TSQ)

	<b>Total (n=292)</b>	<b>Resident (n=61)</b>	<b>Attending (n=182)</b>	<b>Retired (n=39)</b>	<b>Non-practicing (n=10)</b>
<b>Depression</b>					
HADS-D score above cut-off	14 (4.8)	3 (4.9)	11 (6.0)	0 (0.0)	0 (0.0)
<b>Anxiety</b>					
HADS-A score above cut-off	24 (8.3)	7 (11.5)	15 (8.2)	1 (2.6)	1 (10.0)
<b>Combined anxiety &amp; depression</b>					
Combined HADS score above cut-off	35 (12.0)	9 (14.8)	24 (13.2)	1 (2.6)	1 (10.0)
<b>PTSD</b>					
Traumatic experience (criterion A)	57 (19.5)	16 (26.2)	32 (17.6)	7 (17.9)	2 (20.0)
TSQ score above cut-off	1 (0.3)	0 (0.0)	1 (0.6)	0 (0.0)	0 (0.0)

All values shown as : n (%). \* =  $\chi^2$ .

Table IV. — Mental health – Outcomes validated instruments (HADS + TSQ) (2)

	<b>Practicing (n=243)</b>	<b>Non-practicing (n=49)</b>	
<b>Mean scores</b>			
HADS-D	2.62 ± 2.52	1.76 ± 1.79	<i>p=0.032*</i>
HADS-A	3.95 ± 2.55	2.78 ± 2.25	<i>p=0.001*</i>
Combined HADS	6.56 ± 4.58	4.53 ± 3.59	<i>p=0.002*</i>
TSQ	1.56 ± 1.67	0.85 ± 1.73	<i>p=0.116*</i>

Outcomes shown as mean ± SD. \* = Mann-Whitney U.

Seventy-three respondents (25%) seriously considered quitting their job at some point in their career. Most common reasons (table VI) for

this were a disbalance between work- and private life (55.4%), too much bureaucracy (50.0%), too high workload (46.7%), too much administration

Table V. — Work related stressors  
“What do you consider to be an adverse event on the work-floor (more answers possible)?”

	Respondents (n=292)
Missing a diagnosis	173 (59.2)
Doubting whether right decision is made	107 (36.6)
When a patient will remain severely handicapped	107 (36.6)
Death of a patient	78 (26.7)
reating a critically ill patient	53 (18.2)
Bad news conversations	49 (16.8)
When complications occur	29 (9.9)
Having to refuse a patient	28 (9.6)
Switching to an abstaining course of treatment	24 (8.2)
Work conditions (i.e. high workload, long shifts)	16 (5.5)
Not applicable	14 (4.8)
When an inexperienced colleague is on call	14 (4.8)
Complaint (at disciplinary board)	14 (4.8)
Treating a young patient	12 (4.1)
Arguments/issues with colleagues	10 (3.4)
Difficult patients	9 (3.1)

All values shown as : n(%).

(39.1%), too many rules 32.6%), issues with colleagues (27.2%) and disutility (27.2%). Seven percent reported to seriously consider leaving their profession due to a traumatic experience on the work-floor.

The most common coping strategies, or activities undertaken after adverse/traumatic events (table VII) were: support from colleagues (80.7%), support from friends and family (59.3%), doing sports (26.6%) or seeking some other form of distraction (24.8%). When asked about where they had learnt coping strategies (table VIII), 54.5% answered during residency, 45.2% as an attending, 33.9% during clerkships and 24% reported to having never learnt coping strategies.

Current support (table IX), or what was organised after an adverse event, comprised mostly of peer-support from direct colleagues (47.8%), followed by discussing the situation with the present team (35.3%). Fifty-nine (20.4%) respondents reported that there was no support at all and only 6.6% sought professional help (such as psychologist or coach). None reported seeking support by means of

Table VI. — “What was the reason to consider quitting (more answers possible)?”\*

	Respondents (n=92)
Disbalance between work and private life	51 (55.4)
Too much bureaucracy	46 (50.0)
A high workload	43 (46.7)
Too much administration	36 (39.1)
Too many rules	30 (32.6)
Bad collaboration with a co-worker	25 (27.2)
Disutility	25 (27.2)
Too much stress	23 (25.0)
A new challenge	21 (22.8)
Complaints (at disciplinary board)	16 (17.4)
Too much responsibility	15 (16.3)
Pessimistic outlook on the job market	15 (16.3)
Problems in the partnership	14 (15.2)
Afraid to make mistakes	13 (14.1)
Disagreements with work providers	10 (10.9)
Private reasons	10 (10.9)
Not challenging enough (in the field)	9 (9.8)
Different interests	9 (9.8)
Insufficient guidance from supervisors	8 (8.7)
Traumatic experience on the work-floor	6 (6.5)
One-sided	6 (6.5)
Too much complications	4 (4.3)
Patient-violence	4 (4.3)
Work content	3 (3.3)

All values shown as : n (%). \*= previous question answered with ‘yes’.

a medical officer. When asked what the preferred form of support (table X) was, respondents answered peer-support from direct colleagues (62.0%), discussing the situation with the present team (61.3%), followed by professionally organised peer-support (20.9%) and peer-support from indirect colleagues (16.1%). Nine (3.1%) subjects thought (any form of) support was unnecessary.

After being exposed to an adverse/traumatic event on the work-floor, 61 respondents (20.9%) adjusted their work. Most common adjustments (table XI) were more diagnostic tests (72.9%), calling a colleague earlier (32.2%) and starting earlier with treatment (16.9%). One hundred ninety respondents (65.1%) reported to have become more defensive over time. This was highest among the residents, where 71.2% reported to have become more defensive compared to 66.5% of the attendings.

Table VII. — Coping and support  
 “How do you cope with adverse events on the work-floor  
 (more answers possible)?”

	<b>Respondents (n=292)</b>
Discussing the matter with colleagues	234 (80.7)
Talking to friends and family	172 (59.3)
Working out (more)	77 (26.6)
Seeking distraction	72 (24.8)
Hide away emotions	38 (13.1)
Seeking professional help	17 (5.9)
Not applicable	13 (4.5)
Going home (a.s.a.p.)	11 (3.8)
Drink (more) alcohol	9 (3.1)
Praying, or other religious activity	8 (2.8)
Think about a solution	6 (2.1)
Work less	5 (1.7)
Smoke (more) cigarettes	4 (1.4)
Quitting (the job)	4 (1.4)
Do more research	4 (1.4)
Talk to the patient	2 (0.7)

All values shown as : n (%).

Table VIII . — Coping and support  
 “You’ve learned to cope with adverse events through/during  
 (more answers possible)”

	<b>Respondents (n=292)</b>
Residency	159 (54.5)
Attending	132 (45.2)
Clerkschips	99 (33.9)
Internships	92 (31.5)
Never learnt	70 (24.0)
Medical school	53 (18.2)
Peer-review	28 (9.6)
Specific training	24 (8.2)
Experience over the years	23 (7.9)
Mindfulness	17 (5.8)
Private setting	14 (4.8)
Other job/study	13 (4.5)
Psychological help	11 (3.8)
Topsport	3 (1.0)
Research time	2 (0.7)

All values shown as : n (%).

Furthermore, 192 respondents (65.7%) considered current support to be sufficient, while 113 (38.5%) think a culture change regarding support organized by the hospital is necessary. Two hundred eight respondents (71.2%) think it should be mandatory for the hospital to organize support.

Table IX. — Coping and support  
 “Current support after an adverse event consisted of (more  
 answers possible):”

	<b>Respondents (n=292)</b>
Peer-support with direct colleagues	138 (47.8)
Evaluation with the present team	102 (35.3)
There was none	59 (20.4)
Not applicable	50 (17.3)
Peer-support with indirect colleagues	44 (15.2)
Psychologist or coach	19 (6.6)
Professionally organised peer-support	10 (3.5)
Talking to friends and family	5 (1.7)
Never sought help	4 (1.4)
Help from the medical officer	0 (0.0)

All values shown as : n (%).

Table X. — Coping and support  
 “Your preferred support after an adverse event would be  
 (more answers possible)”

	<b>Respondents (n=292)</b>
Peer-support with direct colleagues	181 (62.0)
Evaluation with the present team	179 (61.3)
Professionally organised peer-support	61 (20.9)
Peer-support with indirect colleagues	47 (16.1)
Psychologist or coach	42 (14.4)
Not applicable	20 (6.8)
Mindfulness	17 (5.8)
Support is unnecessary	9 (3.1)
Depends on situation	4 (1.4)
Juridical advice	1 (0.3)
Talking to friends and family	0 (0.0)

All values shown as : n (%).

Table XI. — Coping and support  
 “What have you changed in your work conditions  
 (more answers possible)?”\*

	<b>Respondents (n=59)</b>
More diagnostic tests	43 (72.9)
Calling a colleague sooner	19 (32.2)
Start treatment sooner	10 (16.9)
Work less	7 (11.9)
Quit	6 (10.2)
Better communication with patient(s)	4 (6.8)
More documentation	3 (5.1)
Refrain from treatment	3 (5.1)
Only doing one thing at a time	2 (3.4)
No nightshifts at all	1 (1.7)
More research	1 (1.7)
Less nightshifts	0 (0.0)

All values shown as : n (%). \* = previous question answered with ‘yes’.

Regarding the issue whether there is a protocol available for support after adverse/traumatic events, the majority (51%) was unaware. Only 55 respondents (18.9%) answered with 'yes'.

## DISCUSSION

Prevalence rates of depression and anxiety among orthopaedic surgeons were 4.8% and 8.3%, respectively. Both are higher compared to a one-year prevalence of a large study performed in the Netherlands, the Nemesis-2, where rates of 3.0% for depression and 6.0% for anxiety were found among subjects with a high income (7). Statistical tests to see whether the found difference was significantly different from the Nemesis-2 (7) were not carried out because the Nemesis-2 was conducted on clinical interviews, which might make for an unfair comparison. Nevertheless, it does illustrate that orthopaedic surgeons are more anxious and depressed compared to the general population with high income. This finding is in line with the current literature, where even higher prevalence rates for depression and anxiety were found among medical students, residents and physicians (12,15,16,23,19).

In this sample, 19.5% reported to have perceived an event as traumatic; this lies within the range of 10.4% and 43.3% of Seys et al. (17).

Most of these experiences involved a complication or death of a patient, but also included patient violence. Of the people who reported to have experienced a traumatic event, only one person screened positive for PTSD, giving a work-related prevalence of 0.3% of the whole sample. This is lower compared to the general population with a high income in the Netherlands (7), which has a one-year prevalence of 1.2%. However, this reference rate is not specific for work-related PTSD and could imply for the found rate of 0.3% to be as expected. Unfortunately comparable literature remains to be found.

One does have to take into account that the population size in this sample is small and that PTSD is not a common disorder, implying that it is difficult to acquire comparable values. Other reasons for this value being lower could be that physicians in general have developed a mental flexibility over the course

of their career and are thereby not experiencing adverse events as traumatic as such. It could also be hypothesized that orthopaedic surgeons are less prone to develop PTSD, which is in line with Bernburg et al. (7). One has to acknowledge that there could be an underreporting, due to a culture where one does not complain as well as not being able to admit mental health problems. These possible hypotheses do suggest further research on this topic to be necessary to distinguish whether this finding is an outlier or not.

In this study, orthopaedic surgeons considered the following events to have a high emotional impact: missing a diagnosis (59.2%), followed by a patient being severely handicapped (36.6%) and doubting whether the right decision was made (36.6%). Carrying out a bad news conversation was also among the answers. This is in line with previous research, which states that minor complications, such as disciplinary complaints and conflicts with co-workers can be experienced as adverse/traumatic as well, as opposed to major complications, like the death of a patient (6).

Orthopaedic surgeons used the following coping strategies: the majority acquired support from colleagues (80.7%) or friends and family (59.3%), thus keeping things in a small social circle. This finding is in line with a study among American obstetricians where peer-support and support from friends and family was among the five most common coping mechanisms after an adverse event such as a stillbirth (11).

However, 16.4% reported to have never learnt how to cope with adverse events, which is not uncommon among high-risk specialisms. Boyle et al. (7) states that more than 90% of physicians believe additional training is necessary, for example on how to handle a medical error. Reasons for absence of sufficient coping strategies could be caused by perceived barriers to ask for (2), low awareness of support systems and time constraints (13). This is in line with the finding of this study that nobody sought help from a medical officer and that half of the sample was not aware of the existence of a protocol. Also, orthopaedic surgeons reported to have become more defensive with about 20% changing their work, of which about 75% would

carry out more diagnostic tests. The latter insinuates that more research is needed to address the hypothesis whether better organisation of support systems would lead to a decrease in carrying out diagnostic tests, which could be of interest from a healthcare-insurance point of view.

Finally, this study showed that orthopaedic surgeons do feel the need for support following adverse events, as 71% think it should be mandatory that the institution organizes such support. This illustrates the importance of the subject of mental health of physicians and that more development on this subject is still to be made.

Little research has been done on this particular subject, making this current study a valuable addition to what is already known. The extensive survey allowed for comprehensive and detailed data collection.

The overall response rate of 29% is above average, as it was higher than the average email response rate of 25% (27). Similar rates have been found in comparable studies (3,16,19).

A limitation of this study is that the population is relatively small, and obviously limited to one country in Europe. This makes it difficult to translate the results to other countries, to see if these results are true for all orthopaedic surgeons in the world. In addition to this, there is a population bias. Firstly, the non-practicing group (n=49) is small compared to the practicing group. One could argue that sending the survey invitations by means of the orthopaedic association could cause a selection bias, even though the orthopaedic association does govern contact details of retired and non-practicing orthopaedic surgeons. Secondly, there lies the possibility that severely traumatized subjects refrain from entering the questionnaire, both leading to underreporting of the psychiatric disorders.

Since the study of Baas et al. (2) among gynaecologists has been carried out, awareness of physicians' mental health has increased over the years, along with the addition of extra emphasis on this subject in the framework of the CanMEDS (10) in 2015. This new shift in attention could contribute to a lower outcome for prevalence of PTSD, anxiety and depression as compared to prior studies, simply because there is more awareness among physicians.

There was no correction for multiple testing. However, this study was of exploratory nature, and therefore it was not deemed necessary.

We emphasize that more research is needed on this subject and that, for now, this study provides a good addition to the current research and hopefully kickstarts further investigations among other specialisms.

## CONCLUSION

Orthopaedic surgeons are exposed to adverse events over the course of their career, which may have a high emotional impact. In this study, the prevalence rate for depression and anxiety were higher among orthopaedic surgeons compared to the general population but lower than described in other research on depressive symptoms among physicians, suggesting orthopaedic surgeons to be less prone to develop depression or anxiety disorders compared to peers from a different specialism.

The rate for PTSD was lower ; although this could be due to the small, possibly biased, sample size or personality traits. This study confirms that support after adverse events is desired among orthopaedic surgeons and that we must look out for each other in order to provide optimal patient care.

### Abbreviations

DSM-5 : Diagnostic and Statistical Manual of Mental Disorders 5<sup>th</sup> edition

PTSD : Posttraumatic Stress Disorder

HADS : Hospital Anxiety and Depression Scale.

TSQ : Trauma Screening Questionnaire

### Acknowledgements

We would like to thank the Dutch Association of Orthopaedic Surgeons (NOV) and its members, for their cooperation in this study.

### Contribution to authorship

Study was designed by MVP, KS and MVS. HK provided as a spokesperson for the NOV, facilitating the email invitations among its members. LS collected and analyzed the data with support of LD. LS wrote the manuscript under supervision of MVS.

Details of ethics approval : no approval was required.

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## Appendix Questionnaire

**1 What is your gender?**

1. Male
2. Female

**2 What is your age?**

1. 20-29 years
2. 30-39 years
3. 40-49 years
4. 50-59 years
5. 60-69 years
6. ≥ 70 years

**3 Are you a member of the Dutch Orthopaedic Society (NOV)?**

1. Yes
2. No

**4 What is your current position?**

1. Resident
2. Attending physician
3. Retired
4. Non-practicing/management

**5 How many years have you been working in the orthopaedic field as a physician? (including as intern)**

1. ≤ 5 years
2. 6-10 years
3. 11-15 years
4. 16-20 years
5. 21-25 years
6. 26-30 years
7. > 30 years

**6 What do you consider to be an adverse event on the work-floor (more answers possible)?**

1. Not applicable
2. Bad news conversation/interview
3. (Critically) ill patients
4. When a patient dies
5. When you miss a diagnosis
6. When you have to refuse a patient
7. When you're in doubt about whether you're making the right decision
8. When an inexperienced colleague is on call
9. When you decide on an abstaining course of treatment
10. Treatment of young patients
11. When you know a patient remains severely handicapped
12. Other...

**7 How do you cope with adverse events on the work-floor (more answers possible)**

1. Not applicable/ never experienced
2. Seeking professional help
3. Use new medication

4. Drink (more) alcohol
5. Smoke (more) cigarettes
6. Use (more) drugs
7. Work out (more)
8. Going home as soon as possible
9. Call in sick
10. Hide away emotions
11. Find a distraction
12. Praying or other religious activities
13. Talking to friends and family
14. Informally discussing the matter with peers/colleagues
15. Quitting
16. Work less
17. Other...

**8 The current support organized by your institution after an adverse event is good:**

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

**9 There is plenty of room to informally discuss adverse events in the department/partnership:**

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

**10 There is plenty to informally discuss adverse events in the hospital:**

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

**11 There should be a change of culture regarding support after an adverse event:**

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

**12 There is a protocol available at your institution regarding support after an adverse event:**

1. Yes
2. Yes, but nobody uses it
3. No, but there's one currently being created
4. No
5. I don't know

**13 Support after an adverse event consisted of (more answers possible):**

1. I've never experienced an adverse event
2. There was none

3. Professionally organised peer-support
4. Self-initiated peer-support with direct colleagues (own department)
5. Self-initiated peer support with indirect colleagues (different department)
6. Conversation(s) with a psychologist or coach
7. Evaluation with the present team
8. Help from the medical officer after a sick-leave
9. Other...

**14 Your preferred support after an adverse event would be (more answers possible):**

1. Not applicable
2. Support is unnecessary
3. Professionally organised peer-support
4. Evaluation with the present team
5. Peer-support with direct colleagues (own department)
6. Peer -support with indirect colleagues (different department)
7. Mindfulness
8. Other: ...

**15 It should be mandatory for the hospital to organise support after an adverse event:**

1. Yes
2. No

**16 You've learned to cope with adverse events through/during:**

1. Med-school (without clerkships)
2. Clerkships
3. Internships
4. Residency
5. Attending physician
6. Psychological help
7. Specific course/training
8. Peer-review
9. Mindfulness
10. Never learnt

**17 In the course of time of your career, you've become more defensive:**

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

**18 Have you changed your work-conditions (e.g. less shifts, more diagnostic tests) after experiencing a patient-related adverse event?**

1. Yes
2. No

**19 What have you changed (more answers possible)?**

1. Work less
2. Less evening/night-shifts
3. No evening/night shifts anymore
4. Calling a colleague sooner

5. Quit
6. Start treatment sooner
7. Other...

**20 Have you ever been diagnosed with PTSD (posttraumatic stress-disorder)?**

1. Yes
2. No

**21 Sometimes people experiences traumatic events, such as a live-threatening situation as a cause of a natural disaster, high-impact-trauma or fire; being attacked or raped; witness a murder, death of hear find out someone close to them experienced something terrible. As a physician, one can experience such events in patient-care: critical illness or death of a patient, severe injury, as well as violent behaviour from a patient or their family.**

**Have you ever, during your work AS A PHYSICIAN experienced such (adverse) events/incidents?**

1. Yes
2. No

**22 Did this/these take place less than 4 weeks ago?**

1. Yes
2. No

**23 Can you describe the event/incident?**

1. Yes
2. No

*Trauma Screening Questionnaire (TSQ)*

**Have you experienced:..**

**24 Upsetting thoughts or memories about the event that have come into your mind against your will**

1. Yes
2. No

**25 Upsetting dreams about the event**

1. Yes
2. No

**26 Acting or feeling as though the event were happening again**

1. Yes
2. No

**27 Feeling upset by reminders of the event**

1. Yes
2. No

**28 Bodily reactions (such as fast heartbeat, stomach churning, sweatiness, dizziness) when reminded of the event**

1. Yes
2. No

**29 Difficulty falling or staying asleep**

1. Yes
2. No

**30 Irritability or outbursts of anger**

1. Yes
2. No

**31 Difficulty concentrating**

1. Yes
2. No

**32 Heightened awareness or potential dangers to yourself and others**

1. Yes
2. No

**33 Being jumpy or being startled at something unexpected**

1. Yes
2. No

**34 It is possible that you didn't experience the reactions, such as described on the previous pages, over the past few weeks, but do recognize them from a previous time of your life (e.g. Upsetting thoughts or dreams, reminders, etc.)?**

1. Yes
2. No

**35 Which reactions do you recognize (more answers possible)?**

1. Upsetting thoughts
2. Upsetting dreams
3. Acting/feeling the event is happening again
4. Feeling upset
5. Bodily reactions
6. Difficulty falling/staying asleep
7. Irritability
8. Difficulty concentrating
9. Heightened awareness
10. Being jumpy

**36 For how long did these symptoms last?**

1. < 4 weeks
2. ≥ 4 weeks
3. > 6 months
4. > 1 year

*End TSQ*

*Hospital Anxiety and Depression Scale (HADS)*

**37 I feel tense or wound up.**

1. Most of the time
2. A lot of the time
3. From time to time
4. Not at all

**38 I still enjoy the things I used to enjoy.**

1. Definitely as much
2. Not quite so much
3. Only a little
4. Hardly at all

**39 I get a sort of frightened feeling as if something awful is about to happen.**

1. Very definitely and quite badly
2. Yes, but not too badly
3. little, but it doesn't worry me
4. Not at all

**40 I can laugh and see the funny side of things.**

1. As much as I always could
2. Not quite as much now
3. Definitely not so much now
4. Not at all

**41 Worrying thoughts go through my mind.**

1. A great deal of the time
2. A lot of the time
3. From time to time but not too often
4. Only occasionally

**42 I feel cheerful.**

1. Not at all
2. Not often
3. Sometimes
4. Most of the time

**43 I can sit at ease and feel relaxed.**

1. Definitely
2. Usually
3. Not often
4. Not at all

**44 I feel as if I am slowed down.**

1. Nearly all the time
2. Very often
3. Sometimes
4. Not at all

**45 I get a sort of frightened feeling like 'butterflies' in the stomach.**

1. Not at all
2. Occasionally
3. Quite often
4. Very often

**46 I have lost interest in my appearance.**

1. Definitely
2. I don't take as much care as I should
3. I may not take quite as much care
4. I take just as much care as ever

**47 I feel restless as if I have to be on the move.**

1. Very much indeed
2. Quite a lot
3. Not very much
4. Not at all

**48 I look forward with enjoyment to things**

1. As much as I ever did
2. Rather less than I used to
3. Definitely less than I used to
4. Hardly at all

**49 I get sudden feelings of panic**

1. Very often indeed
2. Quite often
3. Not very often
4. Not at all

**50 I can enjoy a good book or TV program**

1. Often
2. Sometimes
3. Not often
4. Very seldom

*End HADS.*

**51 Have you ever seriously considered quitting your job as orthopaedic surgeon? (e.g. by looking for a different job, talking to human resources about ending your contract)**

1. Yes
2. No

**52 What was the reason to consider quitting (more answers possible)?**

1. Bad collaboration (working together) with a co-worker

2. Not challenging enough within the field
3. A lot of complications
4. Afraid to make mistakes
5. Too much responsibility
6. Traumatic experience on the work-floor
7. Complaint(s) from patients
8. One-sided
9. A lot of stress
10. A high workload
11. Disbalance between work and private live
12. Disagreements with work providers
13. Different interests
14. New challenge
15. Too much administration
16. Too much bureaucracy
17. Patient-violence
18. Too many rules
19. Insufficient guidance from supervisors
20. Problems in the partnership
21. Private reasons
22. Disutility
23. Other...