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Dronkers, W.J.; Amelink, Q.J.M.A.; Buis, D.R.; Broekman, M.L.D.; Spoor, J.K.H.

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Disciplinary law and neurosurgery: a 10-year analysis of cases in the Netherlands

Wouter J. Dronkers, BSc,[1] Quirine J. M. A. Amelink, LLM,[2] Dennis R. Buis, MD, PhD, LLM,[1] Marike L. D. Broekman, MD, PhD, LLM,[3–5] and Jochem K. H. Spoor, MD, LLM[6]

[1]Department of Neurosurgery, Amsterdam University Medical Center, Location AMC, Amsterdam; [2]Faculty of Law, Economics and Governance, Utrecht University, Utrecht; [3]Department of Neurosurgery, Haaglanden Medical Center, The Hague; [4]Department of Neurosurgery, Leiden University Medical Center, Leiden; [6]Department of Neurosurgery, Erasmus Medical Center, Rotterdam, The Netherlands; and [5]Department of Neurology, Massachusetts General Hospital, Boston, Massachusetts

OBJECTIVE Neurosurgery is historically seen as a high-risk medical specialty, with a large percentage of neurosurgeons facing complaints during their careers. The Dutch medicolegal system is characterized by a strong emphasis on informal mediation, which can be accompanied or followed by disciplinary actions. To determine if this system is associated with a low overall risk for medical litigation through disciplinary law, the authors conducted a review of disciplinary cases involving neurosurgeons in the Netherlands.

METHODS The authors reviewed legal cases that had been filed against consultant neurosurgeons and neurosurgical residents under the Dutch disciplinary law for medical professions between 2009 and 2019.

RESULTS A total of 1322 neurosurgical care–related cases from 2009 to 2019 were reviewed. Fifty-seven (4.3%) cases were filed against neurosurgeons (40 first-instance cases, 17 appeal cases). In total, 123 complaints were filed in the 40 first-instance cases. Most of these cases were related to spine surgery (62.5%), followed by cranial surgery (27.5%), peripheral nerve surgery (7.5%), and pediatric neurosurgery (2.5%). Complaints were filed in all stages of care but were mostly related to preoperative and intraoperative care.

CONCLUSIONS The risk for medically related litigation in neurosurgery in the Netherlands through disciplinary law is low but not negligible. Although the absolute number of cases is low, spinal neurosurgery was found to be a risk factor for complaints. The relatively high number of cases that involved the sharing of information suggests that specific improvements—focusing on communication—can be made in order to lower the risk for future litigation.

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KEYWORDS health law; disciplinary law; litigation; defensive medicine; neurosurgery

Neurosurgeons are subject to a relatively high number of legal complaints.[1] Annually, 19.1% of all neurosurgeons in the United States face a legal complaint.[2] Among neurosurgeons, spine surgeons are more at risk for such complaints than their colleagues who primarily focus on other neurosurgical procedures.[2–4]

The Dutch medicolegal system offers patients several legal procedures that can be initiated in the case of a complaint, incident, calamity, or failure of communication (Fig. 1). The Dutch healthcare system uses a multistep approach to systematically manage patient complaints regarding their physicians. Patients file a complaint with an independent complaint officer of the hospital whose primary responsibility is to try to establish an agreement and reconciliation between patient and healthcare professional. In January 2016, the Dutch Healthcare Quality, Complaints and Disputes Act (Wet Kwaliteit, klachten en geschillen zorg [Wkkgz Act], 2016) came into force. Initially, complaints are sent to the hospital's complaint officer in order to obtain a judgment from the hospital's complaint committee. If this procedure does not lead to a satisfactory outcome, the patient is able to submit the complaint to a hospital independent dispute committee. The dispute committee is authorized to allocate compensation up to 25,000€.

The Dutch disciplinary system for medical professionals is codified under the Individual Healthcare Professions Act (Wet op de Beroepen in de Individuele Gezondheidszorg [BIG Act], 1993), which defines which healthcare professionals are subject to medical disciplinary procedures (Supplemental Table 1).[5] According to the BIG Act, patients, relatives, the Health and Youth Care

ABBREVIATIONS BIG Act = Individual Healthcare Professions Act; DM = defensive medicine; NVvN = Netherlands Society for Neurosurgery.

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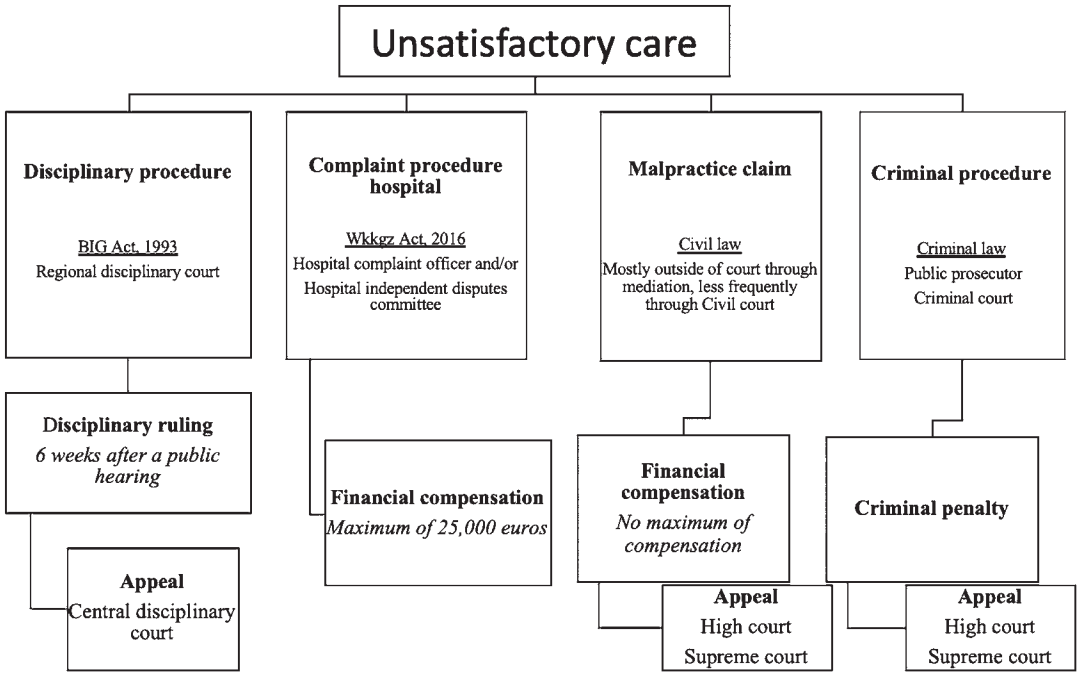

FIG. 1. The Dutch medicolegal system offers patients various ways to complain about unsatisfactory care, depending on the aim of the complaint. The ways for filing a complaint can be used simultaneously.

Inspectorate, and the care director of a healthcare institution may independently file a complaint at the medical disciplinary courts, an independent governmental institution. There are five courts for first instances and one court of appeal. Their legal officers may propose an amicable solution or decide to forward the complaint to a court. The court consists of five members, two legal and three medical professionals. It can impose measures on an individual healthcare professional, including a warning, a reprimand, a fine of up to 4500€, a temporary suspension, or a permanent revocation of a medical license.[6] An appeal against verdicts in a first instance is possible at the Central Medical Disciplinary Court in The Hague. Financial compensation for the patient can only be claimed in civil procedures. The mean payout of financial compensation is low in comparison to that in the United States.[2] In rare cases of serious misconduct or malpractice during medical treatment, a public prosecutor may initiate a criminal procedure.

The various legal routes can be initiated independently. It is therefore possible for a neurosurgeon to be given a disciplinary ruling and to be sued for medical malpractice for financial compensation. To date, no research has been performed on the medicolegal climate with regard to neurosurgery in the Netherlands. This study assesses the complaints that have been filed against neurosurgeons under Dutch disciplinary law and aims to provide a qualitative analysis of neurosurgery-related complaints in the Netherlands and compare their outcomes with those of other legal systems. In line with previous research on medical litigation, we hypothesized that spine surgery represents a greater risk for complaints than other neurosurgical subspecialties.

Methods

Data Source

Complaints are handled by the Dutch disciplinary court, and 6 weeks after a public hearing the ruling is published in a standardized and anonymized fashion (on https://tuchtrecht.overheid.nl; Supplemental Table 2). The same standardized structure is used for the publication of appeal rulings. The publications of these hearings served as the primary information source in this study.

Data Collection and Analysis

Potential legal cases were identified using the open access website of the Dutch Disciplinary Court for Medical Professionals' records using Dutch neurosurgery-related search terms between November 2019 and February 2020 (Supplemental Fig. 1). The search was limited to 2009–2019. Cases were included if the principal defendant was a consultant neurosurgeon or neurosurgical resident and the complaint was directly related to neurosurgical care. Complaints filed against physicians of other specialties were excluded from our analysis. The selection of cases was independently made by two authors (W.J.D. and Q.J.M.A.A.). Selected cases were thereafter read by another author (J.K.H.S.) and discussed among all authors. The type of neurosurgery, neurosurgical procedure, clinical notes included in the legal case, actual complaint, and ruling were extracted from the ruling publication. Cases were categorized by neurosurgical subspecialty: cranial, spinal cord, peripheral nerve, and other (e.g., pediatric neurosurgery). Cases with multiple complaints were categorized by stage of care: preoperative, perioperative, postoperative, and other complaints not related to a specific stage of care. De-

TABLE 1. Characteristics of 57 disciplinary cases

Variable	First Instance	Appeal
No. of legal cases	40	17
Time btwn filing & rulings in days (range)	301 (116–486)	368 (234–502)
Patient died in treatment course, no.	3	1
Defendant, no.		
Consultant neurosurgeon	38	15
Neurosurgical resident	2	2
Male	39	17
Plaintiff, no.		
Patient	33	13
Relative	3	1
Inspectorate	4	2
Other	0	1
Sex of plaintiff, no.		
Female	25	9
Male	11	6
Unknown	4	2

TABLE 2. Characteristics of 40 first-instance cases

Characteristic	No. (%)
Subspecialty	
Spine	25 (62.5)
Cranial	11 (27.5)
Peripheral nerve	3 (7.5)
Pediatric	1 (2.5)
Primary diagnosis	
Spinal stenosis	16 (40.0)
HNP	8 (20.0)
Tumor	8 (20.0)
Vascular	2 (5.0)
Cranial trauma	2 (5.0)
CTS	2 (5.0)
Epilepsy	1 (2.5)
Meningitis	1 (2.5)
Procedure	
Laminectomy	11 (27.5)
Tumor resection	6 (15.0)
Discectomy	5 (12.5)
Spondylolisthesis	3 (7.5)
CTS release	2 (5.0)
Decompression craniotomy	1 (2.5)
No surgical intervention	8 (20.0)
Not specified	4 (10.0)

CTS = carpal tunnel syndrome; HNP = herniated nucleus pulposus.

scriptive statistics were performed for all variables using IBM SPSS Statistics software, version 23 (IBM Corp.). A p value < 0.05 was considered statistically significant.

Results

Data on the Number of Neurosurgical Procedures in the Netherlands

The Netherlands Society for Neurosurgery (Nederlandse Vereniging voor Neurochirurgie [NVvN]) indicated that approximately 151 consultant neurosurgeons are annually in practice, covering roughly 18 million citizens. The NVvN estimated a female/male ratio of 1:8 among neurosurgeons. No precise data are available with regard to the total number of neurosurgical procedures in the Netherlands since these data are actively registered by neither the Dutch Ministry of Health nor the NVvN. In this study, we made a distinction between procedures that fall under the Law on Special Medical Operations (Wet Bijzondere Medische Verrichtingen [Wbmv Act]; e.g., cranial surgery, complex spinal procedures, and pediatric neurosurgery, requiring intensive postoperative monitoring) and procedures that do not. Comparing multiple neurosurgical practices in the Netherlands, we estimate the ratio between spinal and nonspinal surgery to be within the range of 1:1 to 3:1.

Case Characteristics

We reviewed 1322 legal cases that had been filed through the Dutch Disciplinary Court for Medical Professionals between 2009 and 2019 and involved some form of neurological care. Case characteristics are summarized in Table 1. In total, 57 (4.3%) legal cases were filed against consultant neurosurgeons and neurosurgical residents, 40 (70.2%) of which were first-instance cases; the remaining 17 (29.8%) were cases in appeal. The defendants (95%) in all first-instance cases except for two were consultant neurosurgeons. All cases except for one were formed against a male neurosurgeon. Most first-instance cases were filed by patients (82.5%), followed by the inspectorate (10%) and relatives (7.5%). In 25 (62.5%) first-instance cases, the complainant was female. The median (IQR) time between filing a first-instance case and the first ruling was 301 (185) days (range 116–486 days). The median (IQR) time between filing a case in appeal and the second ruling was 368 (134.25) days (range 234–502 days).

Neurosurgical Case Characteristics

Neurosurgical characteristics for first-instance cases are summarized in Table 2. Twenty-five (62.5%) first-instance cases involved spinal surgery, followed by 11 (27.5%) cranial surgery cases, 3 (7.5%) peripheral nerve cases, and 1 (2.5%) pediatric neurosurgery case. Indications for treatment were as follows: 16 (40%) cases of spinal stenosis, 8 (20%) cases of herniated discs, 8 (20%) tumor cases, 2 (5%) neurovascular cases, 2 (5%) cranial trauma cases, 2 (5%) carpal tunnel syndrome cases, 1 (2.5%) epilepsy case, and 1 (2.5%) cerebral infection case. With regard to type of procedure, a laminectomy was most frequently involved with 11 (27.5%) cases, followed by 6 (15%) cases of tumor resection and 5 (12.5%) cases that involved a discectomy. In 8 (20%) cases, no surgical procedure was performed. Three of these cases involved complaints regarding the decision not to perform surgery or additional diagnostics.

TABLE 3. First-instance complaints per filing topic and stage of care

Variable	Spine	Cranial	Peripheral Nerve	Pediatric	Subtotal (no. [%])
Original filing topic, n = 40					
Wrong treatment/diagnosis	11	9	3	—	23 (57.5)
Insufficient information	8	1	—	—	9 (22.5)
No/insufficient care	6	—	—	1	7 (17.5)
Professional secrecy	—	1	—	—	1 (2.5)
Other	—	—	—	—	0 (0)
Complaints per stage of care, n = 123					
Preop					44 (35.8)
Information provision	15	5	—	—	
Diagnostics	8	6	1	—	
Other	5	4	—	—	
Periop					35 (28.5)
Unjustified surgery	4	2	2	—	
Poor surgical performance	14	3	1	1	
Other	7	1	—	—	
Postop					24 (19.5)
In-hospital care	8	—	—	—	
FU	13	—	—	—	
Other	2	1	—	—	
Not related to stage of care					20 (16.3)
Attitude	6	5	—	—	
Secrecy	—	1	—	—	
Other	5	3	—	—	

FU = follow-up; n = number.

Complaints

The Dutch disciplinary court uses predetermined topics under which a complaint can be filed. These topics are summarized in Table 3. Twenty-three (57.5%) cases involved complaints about the wrong treatment or diagnosis, followed by 9 (22.5%) cases of providing insufficient information and 7 (17.5%) cases of insufficient care. One case involved a breach of professional secrecy. In total, the 40 first-instance cases held 123 complaints. The median number (IQR) of complaints per first-instance case was 2 (2) (range 2–4 complaints). The number of complaints filed per stage of care is summarized in Table 3. Most complaints were related to the treatment of spinal pathology (70.7%), followed by cranial pathology (25.2%) and peripheral nerves (3.3%). Forty-four (35.8%) complaints were related to care in the preoperative stage. Among these, 20 complaints involved insufficient information regarding the treatment course and outcomes, surgical procedure, and risk of peri- and postoperative complications and were most likely to be filed against spine surgeons. Fifteen complaints in the preoperative stage were related to insufficient diagnostics. This mostly involved refraining from performing extra diagnostics or a poor preoperative assessment. Thirty-five filed complaints involved the perioperative or intraoperative stage and mostly consisted of poor surgical performance (54.3%) or unjustified surgery (22.9%), mostly related to spine surgery, followed by cranial and peripheral nerve surgery. Twenty-four (19.5%) complaints were related to postoperative care and were mostly related to insufficient follow-up after discharge (54.2%) in spine cases. Twenty complaints were not specifically related to a stage of care but were filed with regard to professional behavior. One case involved a breach of medical secrecy.

Rulings

First-instance rulings are summarized in Table 4. Rulings were considered unfavorable for the defendant in cases in which a complaint was justified. In 12 (30.0%) cases, the complaints were declared to be justified by the Dutch disciplinary court, resulting in 7 (58.3%) warnings and 4 (33.3%) reprimands. In one case, the Dutch disciplinary court declared a complaint to be justified without further ruling. In spine cases, 36% resulted in an unfavorable ruling for the defendant compared to 27.3% of cranial cases. None of the complaints resulted in a temporary suspension or definite revocation. Most measures were, concordant with the percentage of complaints, related to spine surgery. In 16 cases, either the plaintiff (93.8%) or the neurosurgeon (6.2%) appealed the first ruling. None of the plaintiff appeals were assessed as well founded. One neurosurgeon successfully appealed a case regarding spinal surgery that had been found justified at the first instance. This successful appeal ruled out the warning that had been ruled at the first instance.

TABLE 4. Rulings in 40 first-instance cases per neurosurgical subspecialty

Type of Neurosurgery	Unfounded	FNM	WAR	REP	SUS/REV	No. of URs (%)
Spine	16	1	5	3	—	9 (36.0)
Cranial	8	—	2	1	—	3 (27.3)
Peripheral nerve	3	—	—	—	—	0 (0)
Pediatric	1	—	—	—	—	0 (0)
Total	28	1	7	4	—	12 (30.0)

FNM = founded but no measure was ruled; REP = reprimand; SUS/REV = suspension/revocation; Unfounded = all cases that were considered ungrounded; UR = unfavorable ruling; WAR = warning.

Discussion

In the present study we evaluated legal complaints that had been filed through the Dutch disciplinary law regarding neurosurgical care–related complaints in the Netherlands between 2009 and 2019. Although the absolute number of cases remains relatively small, neurosurgeons face complaints for various reasons; therefore, the risk of litigation should not be disregarded. Nearly 67% of all cases were filed against neurosurgeons concerning spine surgery. The surgical indication that led to the greatest number of complaints was spinal stenosis, followed by herniated discs and tumor surgery. Complaints were mostly filed against consultant neurosurgeons as opposed to residents. Except for one, all cases were filed against male neurosurgeons. Complaints were most likely to be filed by patients themselves. Only a few cases were filed by the inspectorate. Female patients were more likely than men to file complaints. Complaints were especially centered around providing insufficient information and insufficient use of diagnostics during the preoperative stage, poor surgical performance and unsatisfactory results during the perioperative stage, and insufficient follow-up during the postoperative stage.

Previous studies on malpractice-related litigation in neurosurgery have been performed in the United States, Germany, and the United Kingdom.[1–4,7] To the best of our knowledge, no study has yet been performed on disciplinary law. In the Netherlands, approximately 4 cases were annually filed between 2009 and 2019, resulting in an annual risk of 2.2% per neurosurgeon for a complaint filed through disciplinary law. The overall risk of medical litigation cannot yet be determined given the absence of neurosurgery-specific malpractice studies in the Netherlands.[8] In line with previous studies, spinal procedures pose a greater risk for complaints than nonspine procedures.[1,9,10] Several possible explanations can be given for this finding. First, expectations can differ between patients with cranial pathology and those with spinal pathology. Often, in cases of tumor or vascular surgery in the brain, the increased risk of complications and death is accepted by patients given the seriousness of their cranial pathology. Therefore, patients may be more forgiving when it comes to minor complaints in these cases. In the present study, most cases were filed after treatment for spinal stenosis or herniated discs. Most of these patients usually seek medical treatment because of back and leg pain. In these spinal cases, a large number of complaints were filed regarding the preoperative stage of care. Many of these patients filed complaints reporting that they still suffer from back pain after surgery or that they were not aware of the possible adverse events, indicating that there is a risk of providing insufficient information before surgery when it comes to these relatively low-risk procedures. Patient expectations with regard to resolving both back and leg pain should be managed carefully and extensively. The process of informed consent in the Netherlands consists of verbal explanation of the indication for the procedure, the alternatives, the proposed surgery, the most common and worst complications, and the expected outcome. Written information is often provided. The neurosurgeon then makes sure that the patient has understood the information, and when the patient (verbally) agrees with the proposed plan, informed consent has been provided. This process of informed consent is not very standardized, which can leave room for different interpretations. Careful documentation of previously discussed aspects of informed consent is mandatory.

The relatively new Wkkgz Act, which came into effect in 2016, aims to provide better and faster handling of complaints, leading to fewer disciplinary cases. Although no significant decreasing trend could be noted after 2016, the handling of complaints was found to take a relatively shorter time than those in other countries.[4] Regarding neurosurgical cases, the average time until the first ruling was shorter than 10 months and a little over 1 year for rulings in appeal. Nevertheless, given that a substantial number of rulings led to appeal, the overall time between filing a complaint and the final decision was found to be approximately 2 years. Although no precise data on the volume of neurosurgical malpractice cases are yet available, this number is likely to be multifold higher than the number of disciplinary cases.[8,11] Compared to the civil cases, disciplinary rulings are rather short and often result in lower legal costs for patients. To date, there are no precise data on the number of disciplinary cases used in civil procedures. However, in the case of an unsatisfactory ruling for the complainant, it is not likely for patients to pursue a civil procedure. In the case of a satisfactory ruling for the complainant, the disciplinary ruling may serve as additional legal proof.[12] Whether filing a complaint through disciplinary law results in patient satisfaction remains unclear.

The impact of disciplinary actions mainly consists of the psychological stress of the process itself and the negative impact on one's reputation. Disciplinary cases are open to the public. Moreover, depending on the imposed measure, the disciplinary court can publish the name of the medical professional and the particular measure. This openness can put a physician's credentials into jeopardy and therefore represents a potential hazard for defensive medicine (DM). The concept of DM refers to a practice that is partly driven to counter such complaints and therefore occurs more often in high-risk fields such as neurosurgery.[13,14] Generally, two types of DM are distinguished: positive DM, involving the practice of prescribing unnecessary additional treatment out of fear of disciplinary complaints and claims; and negative DM, involving the avoidance of specific high-risk treatments and procedures,

which could compromise clinical decision-making.[15] Thus, positive DM may not only result in immediate adverse events for patients (e.g., unnecessary exposure to radiation), but also lead to increased healthcare costs. Negative DM, on the other hand, can result in the undertreatment of specific patients, which can also lead to an increase in healthcare costs. Our study shows that the annual risk for complaints through disciplinary law is relatively low. One could conclude that the risk of DM in neurosurgery in the Netherlands is low. Indeed, a recent survey of neurosurgeons showed that, relative to their American peers, Dutch neurosurgeons view their insurance premiums as less burdensome, their patients as less of a legal threat, and their practice as less risky in general. Legal expenses and malpractice payouts do not, in general, constitute a financial risk for Dutch neurosurgeons, as these expenses are generally relatively low and most often paid by the hospital.[13]

This study has some limitations. First, we were not able to attain a precise annual volume of neurosurgical procedures. Second, the relatively low number of neurosurgical cases cannot be compared with other medical specialty cases in the Netherlands since research is currently lacking. Although the absolute number of cases is low, the time span of 10 years that was used in the present study is long enough to draw solid conclusions. Regardless, the precise information, reasoning, and decisions that are provided in the publication of the ruling give valuable qualitative information on neurosurgical litigation in the Netherlands.

Conclusions

The risk for medically related litigation in neurosurgery through disciplinary law in the Netherlands is low but not negligible. Most complaints filed against neurosurgeons were unfounded. Even though some complaints resulted in a ruling, no suspension or revocation of the medical license was reported for neurosurgeons during the past 10 years. Although the absolute number of cases is low, spinal neurosurgery is a risk factor for complaints in all different stages of care. Neurosurgeons should be actively reviewing their practice with regard to patient counseling and expectation management, specifically in spine surgery. Future research on medical malpractice should focus on clarifying risk factors for medical litigation, and comparative studies between surgical specialties should be conducted with regard to the risk for medical malpractice.

References

1. Taylor CL. Neurosurgical practice liability: relative risk by procedure type. *Neurosurgery*. 2014;75(6):609–613.
2. Thomas R, Gupta R, Griessenauer CJ, et al. Medical malpractice in neurosurgery: a comprehensive analysis. *World Neurosurg*. 2018;110:e552–e559.
3. Din RS, Yan SC, Cote DJ, et al. Defensive medicine in U.S. spine neurosurgery. *Spine (Phila Pa 1976)*. 2017;42(3):177–185.
4. Ahmadi SA, Sadat H, Scheufler KM, et al. Malpractice claims in spine surgery in Germany: a 5-year analysis. *Spine J*. 2019;19(7):1221–1231.
5. Wet op de beroepen in de individuele gezondheidszorg. Overheid.nl. Accessed September 4, 2020. https://wetten.overheid.nl/BWBR0006251/2020-07-01
6. Alhafaji FY, Frederiks BJ, Legemaate J. The Dutch system of handling complaints in health care. *Med Law*. 2009;28(2):241–255.
7. Elsamadicy AA, Sergesketter AR, Frakes MD, Lad SP. Review of neurosurgery medical professional liability claims in the United States. *Neurosurgery*. 2018;83(5):997–1006.
8. Klemann DMTV, Mertens HJMM, van Merode GG. Health care claims per medical specialty in the Netherlands: a 10-year overview. Article in Dutch. *Ned Tijdschr Geneeskd*. 2019;163:D3548.
9. Hamdan A, Strachan RD, Nath F, Coulter IC. Counting the cost of negligence in neurosurgery: lessons to be learned from 10 years of claims in the NHS. *Br J Neurosurg*. 2015;29(2):169–177.
10. Steele L, Mukherjee S, Stratton-Powell A, et al. Extent of medicolegal burden in neurosurgery - an analysis of the National Health Service Litigation Authority Database. *Br J Neurosurg*. 2015;29(5):622–629.
11. Klemann DMTV, Mertens HJMM, van Merode GG. More and higher claims for damages: analysis of claims for damages in Dutch hospital care 2007–2016. Article in Dutch. *Ned Tijdschr Geneeskd*. 2018;162:D2279.
12. Hendriks A. Tuchtrecht - meer tucht dan recht. *Tijdschrift voor Gezondheidsrecht*. 2015;39(5):322–330.
13. Yan SC, Hulsbergen AFC, Muskens IS, et al. Defensive medicine among neurosurgeons in the Netherlands: a national survey. *Acta Neurochir (Wien)*. 2017;159(12):2341–2350.
14. Nahed BV, Babu MA, Smith TR, Heary RF. Malpractice liability and defensive medicine: a national survey of neurosurgeons. *PLoS One*. 2012;7(6):e39237.
15. Studdert DM, Mello MM, Brennan TA. Medical malpractice. *N Engl J Med*. 2004;350(3):283–292.

Disclosures

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

Author Contributions

Conception and design: Spoor, Dronkers. Acquisition of data: Dronkers. Analysis and interpretation of data: Spoor, Dronkers, Amelink. Drafting the article: Dronkers. Critically revising the article: Spoor, Amelink, Buis, Broekman. Reviewed submitted version of manuscript: Spoor, Buis, Broekman. Approved the final version of the manuscript on behalf of all authors: Spoor. Statistical analysis: Dronkers.

Supplemental Information

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Correspondence

Jochem K. H. Spoor: Erasmus Medical Center, Rotterdam, The Netherlands. j.spoor@erasmusmc.nl.