



# The re-emergence of psychiatric neurosurgery: insights from a cross-national study of newspaper and magazine coverage

Laura Y. Cabrera<sup>1</sup> · Merlin Bittlinger<sup>2</sup> · Hayami Lou<sup>3</sup> · Sabine Müller<sup>2</sup> · Judy Illes<sup>3</sup>

Received: 5 September 2017 / Accepted: 6 December 2017  
© Springer-Verlag GmbH Austria, part of Springer Nature 2017

## Abstract

**Background** Surgical approaches to treat psychiatric disorders have made a comeback. News media plays an essential role in exposing the public to trends in health care such as the re-emergence of therapeutic interventions in psychiatric neurosurgery that were set aside for decades, and in shaping attitudes and acceptance to them.

**Method** We conducted an analysis of media articles covering all types of psychiatric neurosurgery published in Canada, USA, Germany, and Spain between the years 1960 and 2015. We applied both quantitative and qualitative methods to elucidate patterns of reporting for conditions, themes and tone, across geographic regions, time, and for type of intervention.

**Results** Coverage of psychiatric neurosurgery has surged since 2001 and is largely consistent across the countries examined. It focuses on depression and deep brain stimulation, and is explicit about historical context. The tone of coverage becomes more positive for Canada, USA and Spain over time; the tone of coverage from Germany remains cautious. Identity and privacy are among the few ethical and philosophical issues raised, notably in the German press.

**Conclusions** The focused and optimistic attention to contemporary psychiatric neurosurgery in the media, but inattention to ethical issues, places an extra burden on functional neurosurgeons, psychiatrists, and other frontline health professionals to attend to queries from patients and policy makers about the full range of relevant emergent and emerging interventions and the mental health issues to which they may beneficially apply.

**Keywords** Psychiatric neurosurgery · International media coverage · Neuroethics · Medical ethics · Deep brain stimulation

## Introduction

### The landscape of psychiatric neurosurgery

Psychiatric neurosurgery for treating mental health conditions that do not have identifiable structural pathology and are resistant to medical therapy has made a comeback. This re-emergence comes against a dark historical backdrop, fraught with uses and abuses of surgical interventions through Neolithic times, the Middle Ages, and wars and political turmoil in the nineteenth and twentieth centuries.

The earliest accounts of trepanation used by ancient civilizations told tales of the release of demons from affected individuals, through the penetration of the cranium “to permit the noxious material to exhale to the outside” to treat mania and melancholy [34]. The late nineteenth century is often regarded as the time of the birth of modern psychosurgery, with experiments conducted by Gottlieb Burckhardt on patients with

✉ Judy Illes  
jilles@mail.ubc.ca

Laura Y. Cabrera  
laura.cabrera@hc.msu.edu

<sup>1</sup> Center for Ethics & Humanities in the Life Sciences, Department of Translational Science and Molecular Medicine, Michigan State University, East Fee Hall, 965 Fee Road, Rm C211, East Lansing, MI 48824, USA

<sup>2</sup> Charité – Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Department of Psychiatry and Psychotherapy, CCM, Division of Mind and Brain Research, Berlin, Germany

<sup>3</sup> Neuroethics Canada, The University of British Columbia, 2211 Wesbrook Mall, Koerner S124, Vancouver, BC V6T 2B5, Canada

dementia and aggression [21]. This approach was popularized by Portuguese neurologist Egas Moniz, who was awarded the 1949 Nobel Prize in Medicine or Physiology “for his discovery of the therapeutic value of leucotomy in certain psychosis” [22]. Interest in psychosurgery ignited around the world as a result of this work [6] and, as crisis struck for psychiatry in the twentieth century with rising numbers of patients housed in asylums worldwide, psychosurgery was adopted in response [27, 33].

Today, deep brain stimulation (DBS), modern ablative neurosurgical procedures such as thermal or radiofrequency ablation, and radiosurgery (gamma knife, MR-guided focused ultrasound) are under investigation for many different psychiatric and neurological disorders (Fig. 1) [20]. Newer methods, such as closed-loop implantable devices [30] and optogenetics [3], are also now in clinical trials or under investigation in animal models. The prevailing hope is that with ethically sound research and clinical protocols, and adequate regulatory frameworks, these approaches will alleviate suffering from severe neuropsychiatric disorders [13, 24].

Media coverage of the evolution of new trends in medicine and healthcare by traditional and social media can have a significant impact on public attitudes [1, 16, 28, 29]. Psychiatric neurosurgery has been a longstanding focus of attention. Lobotomy, for example, was popularized by the prominent press as a miracle cure, with uncritical enthusiasm that commonly overlooked shortcomings and dangers [5, 27, 33]. Gilbert and Ovadia [9] revealed optimistic reporting of DBS in contemporary media, but also gaps in ethical reflection that they suggested promote uncritical public acceptance. Electroconvulsive therapy (ECT), by contrast, is often depicted as an inhumane or

sadistic form of treatment [12], even when efficacy and safety have been demonstrated [35]. Media coverage can also influence public policy: a critical report in the Wall Street Journal about psychosurgery in China in 2007, for example, led the Ministry of Health of China to ban the use of neurosurgery for schizophrenia, for which it was previously in common use [36].

In light of the re-emergence of historical surgical approaches to mental illness and the emergence of new ones, we sought to uncover the news to which the public is exposed, set against the context of past media patterns. We focused on four countries—Canada, USA, Germany and Spain—each with different cultural and technological legacies of neurosurgery [2, 4, 10, 11, 26]. We hypothesized that the focus of coverage and tone of media articles will differ based on country of origin, type of intervention, and time period of publication. Moreover, we hypothesized that coverage of ethical and regulatory aspects will vary with the different geographic and cultural contexts.

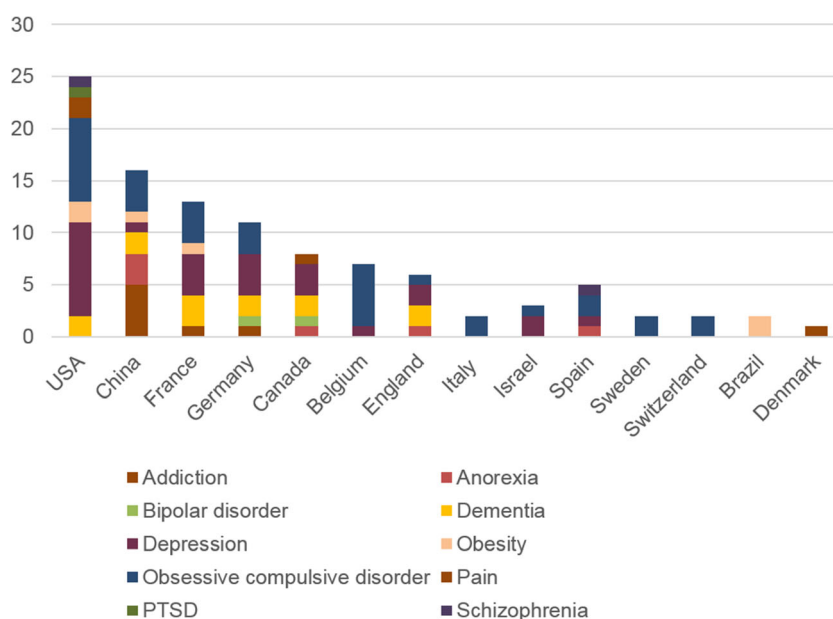
## Methods

We conducted an in-depth content analysis of press media articles on all types of psychiatric neurosurgery for the 55-year period between 1960 and 2015 originating from the four countries of interest.

## Sample

To generate the samples for the study, we selected major national newspapers and magazines from Canada, USA,

**Fig. 1** Registered clinical trials using DBS for neuropsychiatric conditions up to 1 August 2017 ([www.clinicaltrials.gov](http://www.clinicaltrials.gov))



Germany, and Spain. All had a circulation of greater than 90,000, standing science and technology coverage, or both. We used the Factiva database and websites of the selected newspapers and magazines to compile full-length articles that fulfilled two specific criteria: (1) published between 1960 and 2015; (2) focused on at least one psychiatric neurosurgical intervention. Terms and keywords for the search were: ablative neurosurgery, ablative surgery, amygdalectomy, brain implant, brain pacemaker, capsulotomy, cingulotomy, cyberknife, deep brain stimulation, focused ultrasound, gamma knife, hypothalectomy, hypothalamotomy, leucotomy, lobotomy, optogenetics, psychiatric neurosurgery, psychosurgery, radiosurgery, stem cells, stereotactic neurosurgery, thermal ablation, and vagal nerve stimulation. Searches were carried out with these terms on their own and in combination with the term “psychiatric”. Articles with titles suggesting that the content of the article was related to the current or future use of these interventions as a psychiatric therapy were included. Articles adapted from original pieces disseminated by Reuters or the Associated Press, for example, were included. Exact duplicates, and articles unrelated to the application of these interventions as psychiatric treatments were excluded through manual curation of the search returns.

## Procedure

The analysis was carried out by native speakers of the research team (L.C., M.B., H.L., J.I.).

Articles were analyzed for content inductively in which themes were developed as the coding process progressed. Three members of the team (L.C., M.B., H.L.) reviewed and systematically coded 10% of the media articles independently using a constant comparative approach [8] to assure reproducibility of the initial approach [15]. The same members of the team then coded for the phenomena of interest for all articles in the dataset. Each article was coded as a single unit to reflect all the relevant topics it contained; consequently, each article incorporated numerous codes.

Codes were then grouped for quantitative analysis into four major categories: (1) scientific and technological issues; (2) social, legal and political issues; (3) patient/research subject issues; (4) ethical issues. In addition to the thematic categories, the coding team noted primary and secondary interventions and disorders mentioned. A technology or disorder was coded as a secondary mention if it was mentioned in the article but was not the main focus of the article. The team also coded for target brain regions, tone (positive, balanced, negative, or neutral), and content presented as controversial. We coded articles as having a positive tone when the message was optimistic or hopeful overall. For example: “She said she knows there are no guarantees, but ‘if we can beat some of this stuff, or at least get a leading edge on it, I’m in for the whole deal.’” Articles that made straightforward comparisons between risk versus

benefit, or pro versus con assessments were coded as balanced. For example: “‘Just because it looks good at first and everyone gets excited,’ Dr. Mayberg said, ‘does not mean it’s necessarily efficacious or your work is done.’” We coded articles that voiced a pronounced criticism as having a negative tone. For example: “And who’s to say that deep brain stimulation is the solution for these people? A narrow medical model of depression, a complex problem, fails to do justice to human psychology and the human condition.” Finally, we coded articles as having a neutral tone when there was no valence that could be identified in the article. The coders conducted video conferences to discuss questions about coding, and difficult segments or questions regarding coding were addressed and settled by consensus across country teams.

For the analysis, we compared the average number of codes within each of the four categories grouped into the following time periods: before 2001, 2001–2005, 2006, 2010, and 2011–2015. We also computed a type of intervention variable broken down into five categories: (1) historical psychosurgery (e.g., leucotomy, lobotomy), (2) contemporary ablative procedures (with stereotactic frame or imaging guidance, e.g., cingulotomy, capsulotomy), (3) deep brain stimulation, (4) optogenetics, and (5) others (vagal nerve stimulation, radiosurgery, focused ultrasound, stem cells and brain implants or brain computer interfaces other than DBS). Analyses with the variable ‘type of intervention’ used only the first four categories, and only the primary technology discussed in the article. We used the Kuskal-Wallis test to examine differences among categories and chi-square analysis for differences among codes for country of origin, time period, and type of intervention. Spearman’s rank-order correlation was used to quantify the strength and direction of associations between coded categories.

Interpretative analysis of the latent meanings and arguments that underpinned coded frequencies enabled us to place the quantitative findings into a richer narrative context. To this end, we qualitatively examined article narratives according to four time periods, with two of the four being grouped into 5-year periods: early years prior to 2001; into the new millennium, 2001–2006; mounting research, 2006–2010; into the present, 2011 onwards. Selected quotes illustrate theme content.

## Results

The final, manually curated sample for analysis comprised 517 articles [ $n = 51$  from English and  $n = 27$  from French press in Canada;  $n = 123$  from the USA; ( $n = 201$  total articles from North America),  $n = 160$  articles from Spanish press, and  $n = 156$  articles from German press]. We report Canada and the USA together under the umbrella of North America. We did not observe differences between them upon descriptive

analysis, and the strategy gave us sufficient power for statistical analysis.

## Quantitative findings

### Overall coverage across time

Coverage of psychiatric neurosurgery was limited across the countries sampled in the years prior to 2001, and then rose steadily from that year on (Fig. 2).

### Coverage across type of intervention, application, and time

The most common focus of media coverage overall was DBS (Canada/USA = 49%,  $n = 98$ ; Spain = 48%,  $n = 76$ ; Germany = 53%,  $n = 82$ ), in comparison to both historical and contemporary ablative procedures that were covered most frequently before 2001 (Fig. 3).

Reporting during the 2011–2015 period frequently referred back to lobotomy or leucotomy. Ninety-two percent of articles discussing optogenetics were published in this period. DBS was reported more frequently than any other type of intervention for all time periods after 2001.

Depression was the most commonly reported mental health disorder in the articles for North America (42%,  $n = 84$ ), Spain (36%,  $n = 58$ ), and Germany (49%,  $n = 77$ ). Obsessive compulsive disorder (OCD) was the second most frequently reported disorder (North America 16%,  $n = 33$ ; Spain = 24%,  $n = 39$ ; Germany = 33%,  $n = 51$ ) (Fig. 4).

### Tone

The tone of articles was the first variable for which we found significant differences between countries (Fig. 5). Although tone was most frequently positive for all countries, German media articles were significantly more negative (29%,  $n = 45$ ) [ $\chi^2(2) = 49.520$ ,  $p < 0.001$ ] and less often balanced (22%,  $n =$

34) than the others [ $\chi^2(2) = 8.919$ ,  $p = 0.012$ ]. Spanish articles were significantly more positive (52.5%,  $n = 84$ ) [ $\chi^2(2) = 12.027$ ,  $p = 0.027$ ] than articles in the Canadian/US (41.3%,  $n = 83$ ) and German datasets (38.5%,  $n = 60$ ).

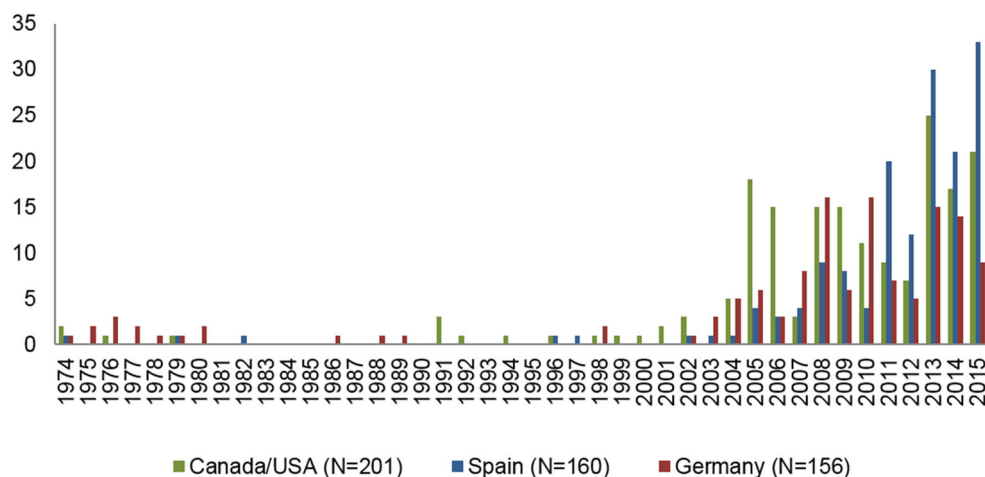
Tone was also markedly different based on type of intervention across countries (Fig. 6). Articles covering optogenetic procedures (66% of all articles mentioning optogenetics,  $n = 50$ ) and DBS (53.2%,  $n = 132$ ) were the most positive [ $\chi^2(3) = 61.131$ ,  $p < 0.001$ ] (Fig. 6a and b). Articles covering ablative procedures, i.e., both historical psychiatric neurosurgery (50%,  $n = 24$ ) and contemporary ablative neurosurgery (50%,  $n = 15$ ), were the most negative [ $\chi^2(3) = 123.54$ ,  $p < 0.001$ ]. On a descriptive level, coverage of historical forms of psychiatric neurosurgery was negative across all time periods analyzed (Fig. 6c). Negative reporting on contemporary psychiatric neurosurgery was mainly restricted to the time period before 2000, and became more balanced after 2005 (Fig. 6d).

Tone also varied by time period. Correlational analyses using the Spearman's rank order correlation revealed a shift from a negative to positive tone across time, and correlations between tone and year of publication for Canada/USA ( $r_s = -0.209$ ,  $p < 0.01$ ) and Germany ( $r_s = -0.303$ ,  $p < 0.001$ ). Reporting from Spain did not present any major difference in tone until the 2011–2015 period, when it became overwhelmingly positive (Fig. 7).

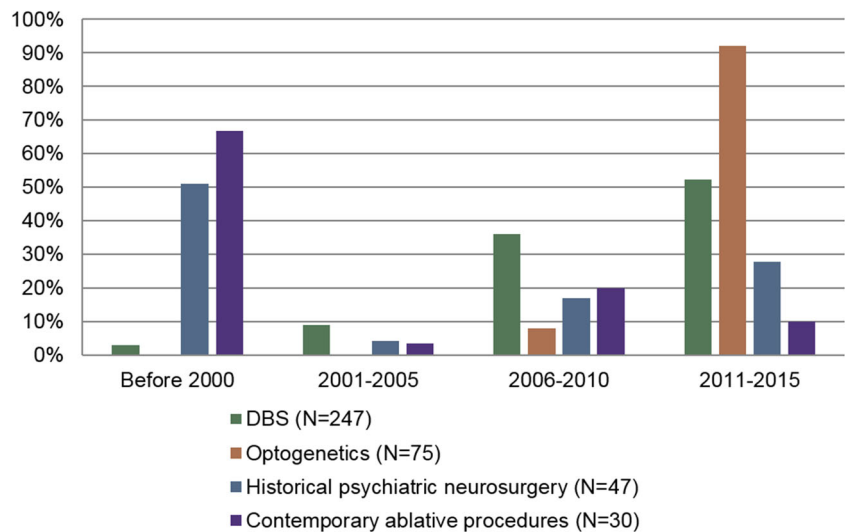
### Ethical and regulatory considerations

Risk was the most highly cited disadvantage in both German (28%,  $n = 43$ ) and Canadian/US-American (13%,  $n = 26$ ) media articles, whereas only 3% ( $n = 4$ ) of Spanish media articles mentioned risk. It was most commonly referenced with respect to earlier forms of ablative procedures (23% of articles covering earlier forms of ablative procedures,  $n = 11$ ) and to contemporary ablative procedures (46.6%,  $n = 14$ ) in comparison with DBS (12.9%,  $n = 32$ ) and optogenetics (1.33%,  $n =$

**Fig. 2** Coverage across time. Number of publications ( $y$  axis) per year ( $x$  axis) across Canada/USA, Spain and Germany (1974–2016)

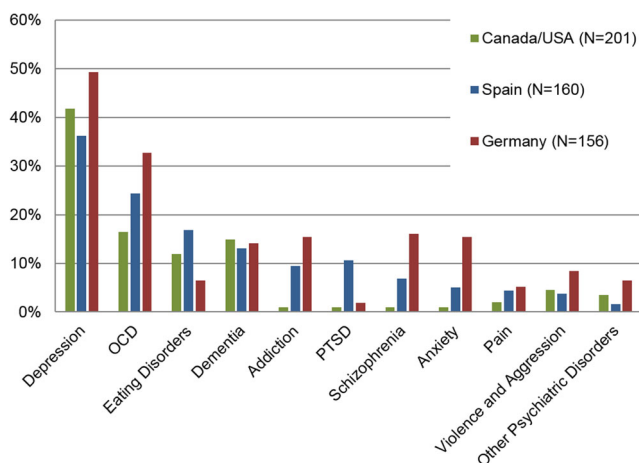


**Fig. 3** Type of intervention by time period. Relative frequency ( $y$  axis) across different time periods ( $x$  axis) for different types of intervention. Percentages of the four types of intervention sum up to 100% for each time bin



1). Informed consent and justice were the primary ethical concerns reported in the North American press (7–10% of articles from Canada and USA). In the German press, the primary ethical concerns mentioned were identity (21%,  $n = 33$ ), issues of control (e.g., mind and social control) (12%,  $n = 18$ ), and enhancement (5%,  $n = 8$ ). In the Spanish media, ethical concerns were reported in fewer than 5% of the articles, as were other ethical concerns beyond those already mentioned for North America and Germany. The number of ethical concerns reported by the North American press was higher in the earlier years of the sample, then decreased over time ( $r_s = -0.251$ ,  $p < 0.001$ ). The number of ethical concerns in the German press did not change over time ( $r_s = -0.078$ ,  $p = 0.335$ ). The few mentions of ethical concerns in press coverage from Spain occurred only in recent years ( $r_s = -0.044$ ,  $p = 0.584$ ).

Discussion of sociopolitical issues also decreased significantly since the early 2000s (North America:  $r_s = -0.216$ ,  $p < 0.01$ ; Germany:  $r_s = -0.359$ ,  $p < 0.001$ ). Discussion of



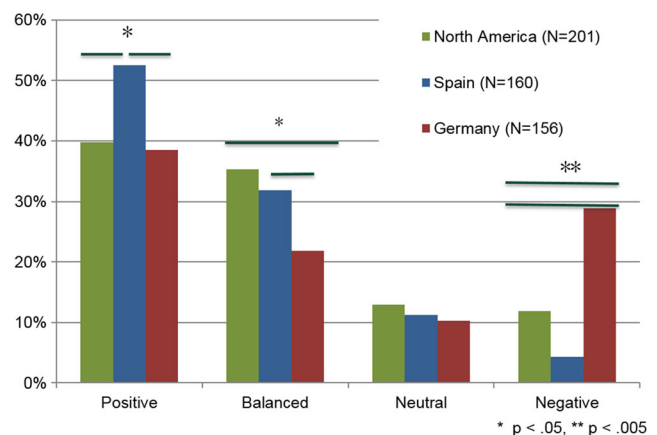
**Fig. 4** Applications of psychiatric neurosurgery. Relative frequency ( $y$  axis) of different disorders mentioned ( $x$  axis) across different countries

regulation was most common in the North American articles (24%,  $n = 48$ ) compared to European counterparts [ $\chi^2(2) = 17.493$ ,  $p < 0.001$ ]. Discussion of regulation was also significantly more common [ $\chi^2(3) = 64.128$ ,  $p < 0.001$ ] for ablative modalities (historical 35.4%,  $n = 17$ ; contemporary 46.7%,  $n = 14$ ) compared to other modalities [DBS (7.3%,  $n = 18$ ); optogenetics (4%,  $n = 3$ )].

## Interpretative analysis

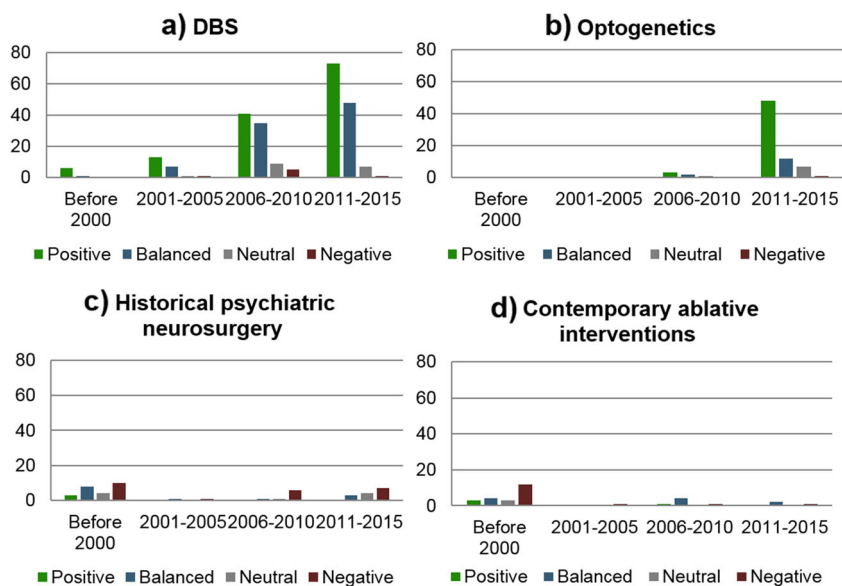
### Early years prior to 2001

Prior to 2001, the news media largely covered stories of patients who had undergone procedures pioneered by Egas Moniz. The German newspaper *Hamburger Abendblatt*, for example, reported on the case of a 21-year-old pathological gambler from Liverpool who consented to a leucotomy (1968, “Operation gegen Spieltrieb”). Other media covered early forms of DBS, and the work of José Delgado, highlighting his success in treating intractable pain, and the potential



**Fig. 5** Tone of reporting. Relative frequency ( $y$  axis) of codes for tone ( $x$  axis) per geographic region. Codes for tone are mutually exclusive

**Fig. 6** Tone of articles by time period and type of intervention. Frequency (y axis) of tone (x axis), for different time periods for **a)** DBS, **b)** optogenetics, **c)** historical psychiatric neurosurgery, and **d)** contemporary ablative interventions



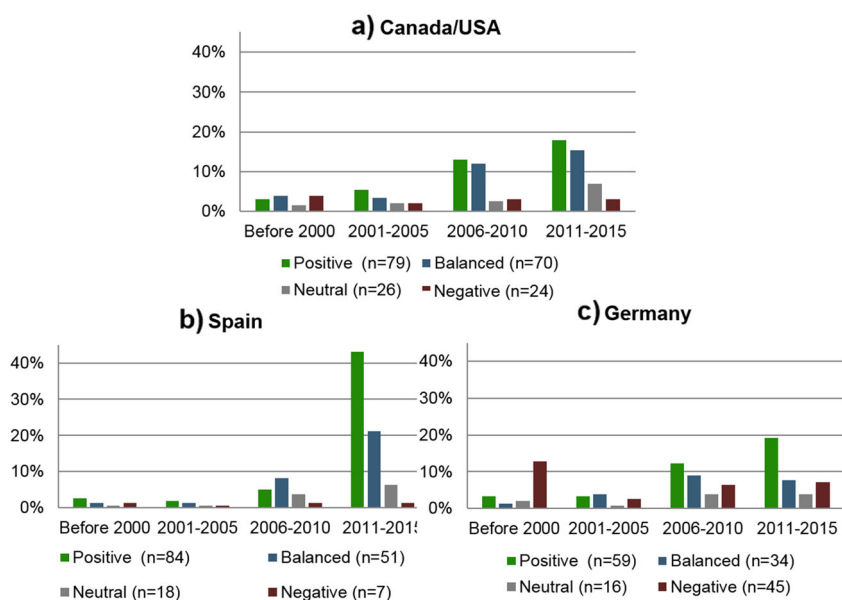
therapeutic implications of electrical stimulation of the brain for chronic major depression (*Die Zeit*, 1974, “Ein Schrittmacher für das Gehirn”). A range of other (former) indications such as hyper-aggressiveness, psychosis, neurosis, phobias, deviant or delinquent sexual behavior were also mentioned.

Risk was a significant theme in the narratives of the early years. The *Hamburger Abendblatt* reported on 21 stereotactic hypothalamotomies, mentioning that these interventions are associated with risks, including blindness, cognitive decline, and personality changes (*Hamburger Abendblatt*, “Umstrittene Hirnoperation im Fernsehen,” 1977):

The known risks so far are pernicious enough. The operated patients need to expect considerable long-term effects, the extent of which the surgeons can only give a vague account of. (*Die Zeit*, 1976, “Weniger Sexualtrieb—mehr Hunger,” translated by M.B.)

Several articles reported on a case of a pedophilic offender, who raped and killed a boy three months after he stopped taking anti-androgenic medication following an unsuccessful hypothalamotomy (e.g., *Der Spiegel*, 1980, “Aus der Fassung”). The heated debate following this case led to the ban of hypothalamotomies for sexual deviance in Germany.

**Fig. 7** Tone of articles by time period and geographic region. Relative frequency (y axis) of tone (x axis), across different time periods for **a)** Canada/USA, **b)** Spain and **c)** Germany



Articles across countries covered regulatory issues arising from the US Federal Health Agency Expert Commission Report on Psychosurgery and the German Federal Minister of Justice. For example:

The debate over psychosurgery figured large in hearings on human experimentation conducted early this year by a Senate subcommittee chaired by Edward M. Kennedy. And the Senate bill that emerged calls for a national commission to examine the ethics of psychosurgery. (*New York Times*, 1973, “For the mentally ill, a court of last resort”)

In May 1974, the Minister of Justice and the Federal Senators of Justice had to deal with hypothalamotomies for the first time ... After that the jurisdiction was occasionally erratic: whereas the Higher Regional Court Hamm dismissed the intervention pretty much out of hand, the responsible Federal Minister of Baden-Württemberg granted pardon to a sexual delinquent on the sole condition that he undergoes stereotactic surgery. (*Die Zeit*, 1979, “Empfehlungen für Seelen-Schneider,” translated by M.B.)

One article made comparisons between Canadian regulation from the province of Ontario with American regulation from the state of Oregon:

Some jurisdictions have gone further than Ontario and established psychosurgery review boards for voluntary, competent patients. For example, a 1973 Oregon statute established a psychosurgery review board consisting of neurosurgeons, psychiatrists, a lawyer and a lay member of the public. The board vetted all applications for psychosurgery to determine whether the consent was voluntary and informed, and to assess the efficacy of the proposed procedure. After this law was challenged, a 1982 statute banned psychosurgery altogether. (*Toronto Star*, 1991, “Lobotomies rare, but need closer scrutiny”)

In this time period, coverage of ethical issues, however minimal, involved informed consent and control:

Another question has to do with consent. Preventing competent patients in psychiatric facilities from consenting to psychosurgery is based on the assumption that the environment of a psychiatric facility impairs an individual’s ability to understand the subject matter being discussed and the consequences of the act for which consent is needed. (*Toronto Star*, 1991, “Lobotomies rare, but need closer scrutiny”)

Widespread and probably still just theoretical ... is the concern that surgical manipulation of the mind could serve to oppress minorities and dissidents and for that reason alone it should remain taboo. (*Die Zeit*, 1976, “Mit dem Skalpell an der Seele,” translated by M.B.)

### Into the new millennium: 2001–2005

Coverage of vagal nerve stimulation (VNS) was more frequent during this period, most notably in North America where the implant was approved in 2005.

Proponents say that many severely depressed patients do not respond to antidepressants or electroshock therapy and that those patients are desperate for any treatment to relieve their suffering. (*The New York Times*, 2005, “F.D.A. considers implant device for depression”)

Furthermore, a few articles report about radiosurgery (Gamma Knife) for treating psychiatric disorders:

Radiosurgery can be used to eliminate drug addiction, according to the experts gathered in Baiona yesterday at the VII Congress of the Spanish Society of Radiosurgery. (*La Voz de Galicia*, 2002, “La radiocirugía puede aplicarse para eliminar la adicción a las drogas,” translated by L.C.)

Issues of cost and industry are significant themes found during this period:

The cost [of VNS] is about \$20,000 for the device and implantation. (*Houston Chronicle*, 2005, “FDA approves implant against depression”)

Cyberonics has invested about \$50 million in clinical development of VNS therapy for depression since 1998. (*Houston Chronicle*, 2005, “FDA says Cyberonic’s device may cause harm”)

The approval will change not only the life of millions of people who suffer from depression, but also the neuromodulation industry. (*El País*, 2005, “EE UU autoriza el uso de implantes electrónicos para tratar la depresión,” translated by L.C.)

Coverage of the effectiveness of interventions and regulatory themes continued, with a similar pattern of reporting to prior to 2001:

Clinical trials so far showed a relatively low efficacy of the system. (*El País*, 2005, “EE UU autoriza el uso de implantes electrónicos para tratar la depresión,” translated by L.C.)

Between 16-20% of patients in the trials reach total remission of their severe depression, while up to 28% had significant reductions in their psychiatric symptoms. (*ABC*, 2005, “El marcapasos contra la depresión,” translated by L.C.)

Last year, the therapy was approved as a treatment for depression in European Union countries, ‘despite the limited evidence’ it helps, according to the Harvard Mental Health Letter, a newsletter published by the Harvard Medical School. (*SFGate*, 2002, “Epilepsy aid may ease depression, Alzheimer’s”)

### Mounting research: 2006–2010

The focus on DBS continued to increase in both the German and North American press, but not in press from Spain. Evidence of concerns related to cost and regulation remained:

Surgery is also expensive, upward of \$30,000 for each patient, and it entails risks. (*The Globe Mail*, 2006, “The on switch”)

[No] one sees this becoming the new Prozac. The procedure costs too much (around \$40,000) to use on anyone who hasn’t tried everything else. (*WIRED*, 2006, “Much madness about depression”)

Deep brain stimulation research also raises ethical questions, such as how to make sure patients who may have diminished capacity to consent understand the risks and benefits of participating in the trials. (*LA Times*, 2009, “With deep brain stimulation, experts want to tread carefully”)

### Into the present: 2011 onwards

A focus on optogenetics characterizes this period, especially in the Spanish media:

[Headline] Cure cocaine addiction with a laser beam (*Tendencias 21*, 2013, translated by L.C.)

[Headline] A ray of light turns the violent meek (*El País*, 2011, translated by L.C.)

Individual benefits and interventions are portrayed as last resort alternatives:

I would not want to deprive [patients] of the option, any more than I would deny someone with AIDS access to a promising therapy that has not been established yet. (*The New York Times*, 2011, “Wariness on surgery of the mind”)

However, societal risks of behavior control via optogenetics were mentioned:

The astounding advances of neuroscience may soon find a more effective way to do the same [create a combined aversion towards violence and sex], and also the opposite: shoot the aggressive behavior of an individual with a simple beam of light. (*El País*, 2011, “Un rayo de luz convierte al violento en manso,” translated by L.C.)

Another very recent technology, MR-guided focused ultrasound, is reported in this period:

Here in the S-wing of Toronto’s Sunnybrook Hospital, Mainprize and his research team accomplished on Thursday what no one in the world has ever done before: using focused ultrasound waves, they have opened the human blood-brain barrier, paving the way for future treatment of an array of currently impossible or hard-to-cure illnesses—from brain cancer to certain forms of depression, stroke, Parkinson’s disease and Alzheimer’s disease. (*The Globe and Mail*, 2015, “Sunnybrook doctor first to perform blood-brain barrier procedure using focused ultrasound waves”)

However, there are very few articles about modern ablative procedures, including microsurgical procedures, radiosurgery and focused ultrasound. When ablative procedures are mentioned, they are mostly used as a contrast to other historical interventions that are seen as ethically problematic, such as the lobotomies of Rosemary Kennedy and Eva Perón:

John F. Kennedy’s sister Rosemary got a lobotomy from Freeman, which left her a vegetable for the rest of her life. And she was one of many people whose ‘cure’ was more like zombification than freedom from mental anguish. (*WIRED*, 2011, “The strange past and promising future of the lobotomy”)

The Argentine icon Eva Peron was subjected to a lobotomy just before her death in 1952 to alleviate the pain caused by her uterus cancer that took her at 33 years, reveals a study published in the magazine *World Neurosurgery*. (*La Presse*, 2011, “Argentine: Eva Perón aurait été lobotomisée avant de mourir ....,” translated by L.C.)

The German press was especially intrigued by neuroenhancement:

The method also works in depressive people. Possibly, it can also be used for purposeful brain doping. (*Focus*,



2014, “Von Chemie bis Strom – So kommt Ihr Verstand auf Hochtouren,” translated by M.B.)

‘Imagine that I could improve your memory performance via the electrodes’, says the neurosurgeon Bart Nuttin, one of the authors. ‘For Alzheimer patients this would be therapeutic treatment.’ For politicians better memory would be desirable, adds the DBS expert jokingly, ‘but this would be enhancement.’ (*Die Zeit*, 2007, “Bauteile für die Seele,” translated by M.B.)

Discussion of risks and other disadvantages or ethical concerns was nearly absent.

## Discussion

### Evolution of news coverage over time

Coverage of psychiatric neurosurgery by major Canadian, USA, German and Spanish print media has both increased and evolved over time. Today, neuromodulation is the main focus; earlier forms of ablative procedures are a comparator to the past. Modern ablative procedures are rarely mentioned in the media. Attention is paid to optogenetics, an emerging technology that may bring new hope for treating psychiatric disorders. Risks are highlighted, but the tone of coverage has shifted from negative to positive overall. Social, political, ethical and philosophical issues, particularly control and identity, are mentioned only minimally. The few differences across countries reflect critical interests in regulatory issues and informed consent in North America, and cautious reservations about the re-emergence of the technology for psychiatric neurosurgery in Germany. The type of intervention plays an important role in the tone of articles and the type of issues being discussed.

The re-emergence of psychiatric neurosurgery after many years of absence from the public eye can be attributed to the 2001 American article, “Medtronic: pacing the field,” following the Nuttin publication of the use of DBS for OCD [23]. The trend in the discussion of DBS across time is uneven, however, and may be the result of different regional events, such as the 2009 US FDA humanitarian device exemption approval, and the European CE mark of DBS for OCD. The exploration and new case reports of novel indications for which DBS has been explored, such as Alzheimer’s, anorexia nervosa, or drug addiction, may also account for notable peaks in coverage in years such as 2008, 2013, and 2015. Similarly, extensive coverage in North America and Spain of VNS between 2001 and 2005 may be linked to the FDA approval of VNS for major depression [25]. The newest technology, optogenetics, is discussed both as a research tool to locate targets for treating mental health disorders and as a possible treatment tool itself.

The shift towards positive coverage across countries is consistent with the evolution of modern psychiatric neurosurgery, which has led to safer and more precise technologies [7, 20, 32]. While notable failures of major DBS trials for depression in 2015 [31] were not covered during the time period of our data capture, the overall optimism is consistent with reports that 90% of practicing neurosurgeons view the future of psychiatric neurosurgery favorably [14, 17].

Optimism aside, recent guidelines authored by an international group of neurosurgeons, neurologists, psychiatrists, and ethicists call for caution [24]. The guidelines emphasize the experimental character of DBS in psychiatry in particular, and explicitly state that psychosurgery “should never be performed for political, law enforcement or social purposes, but with therapeutic intent aimed at the restoration of normal function and amelioration of distress and suffering.”

### Limitations

Our goal was to gather major circulation newspaper and magazine publications with science and technology coverage from Canada, USA, Germany and Spain from media over a 55-year period. However, a small number of articles were not freely accessible to our university databases, and some media webpages did not contain accessible publications prior to 2000. We also acknowledge that, despite rigorous methods, search engines do not return all relevant articles. Our results, however, still capture the relevant trends in coverage, even without the few articles that we might have missed in our search. Three articles had unidentifiable dates. Such missed captures may contribute to the predominance of DBS in the dataset.

To accommodate inclusion of press articles in their original language for analysis, the team comprised coders who are native speakers of the language of the country from which the articles originated. While we took painstaking measures to ensure methodological rigor through well-delineated criteria for inclusion and exclusion of articles, created a coding book following an iterative process of coding, and assessed internal consistency and inter-rater reliability through cross-validation of codings during online meetings to clarify questions and uncertainties, we recognize that regional and individual single-coder bias is still a possibility.

Finally, communication of health-related information through social media such as blogs, Twitter and Instagram is rapidly overtaking news coverage among both the young and older demographics [18]. A separate analysis is needed to elucidate trends through these new media channels. While these types of studies can capture coverage trends across time, technologies and countries, no conclusion about the appropriateness or comparability of the news to the medical literature can be drawn.

## Conclusions

Anthropologists have argued that “different cultural systems have different moral codes with different standards [and thus] ... mechanisms that exist in different cultural groups for handling ethically problematic situations are also culturally specific” [19]. In this regard, we hypothesized that we would find many regional differences in press coverage of psychiatric neurosurgery, but in fact we found few. Looking at the findings in broad strokes, Canada and the USA are focused on therapeutic promise and cost, a phenomenon that may reflect federated, market-driven health care. Germany is more cautious, possibly due to the Nazi past of experimentation without consent—although Germany is not alone in conducting questionable experiments in world history. Spain is optimistic and looks to the future.

The press has an important responsibility to communicate to the public about advances in brain science, and bears an inevitable responsibility in influencing values, perceptions, and views about risk and hope. The largely consistent reporting across international lines is very much positive for the field, in that it promotes clarity over confusion for the interested public and, even more importantly, for affected individuals. However, the products of news media do not stand isolated from other communication channels and means.

The focused and optimistic attention to contemporary psychiatric neurosurgery in the media, but inattention to ethical issues places an extra burden on functional neurosurgeons, psychiatrists, and other frontline health professionals to attend to queries from patients and policy makers about the full range of relevant emergent and emerging interventions and the mental health issues to which they may beneficially apply.

**Acknowledgements** We would like to acknowledge the support of ERA-NET NEURON Team Grant: Ethical, Legal and Social (ELS) Issues #ERN-144241 and the Federal Ministry of Education and Research of Germany (01GP1621A). We also thank the other members of the ERA-NET NEURON psychiatric neurosurgery team, including functional neurosurgeons and legal scholars, for their insightful comments regarding this subproject. We would also thank Julia Porter for data collection for Fig. 1. A reference list of the articles included in the sample can be obtained from the corresponding author.

**Funding** We would like to acknowledge the support of ERA-NET NEURON Canadian Institutes of Health Research (CIHR) Team Grant: Ethical, Legal and Social (ELS) Issues #ERN-144241 (JI) and the Federal Ministry of Education and Research of Germany (01GP1621A; SM). The sponsor had no role in the design or conduct of this research. JI is Canada Research Chair in Neuroethics.

## Compliance with ethical standards

**Conflict of interest** All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or

non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

**Ethical approval** This article does not contain any studies with human participants performed by any of the authors.

## References

1. Bauer MW (2005) Public perceptions and mass media in the biotechnology controversy. *Int J Public Opin Res* 17(1):5–22
2. Burzaco-Santumtun JA (2005) Neurosurgery in the field of psychiatric illness. In: López-Ibor J, Leal Cercós C, Carbonell Masía C (eds) *Images of Spanish psychiatry*. Glosa, Barcelona, pp 1–23
3. Deisseroth K (2012) Optogenetics and psychiatry: applications, challenges, and opportunities. *Biol Psychiatry* 71(12):1030–1032
4. Delgado JM (1969) *Physical control of the mind*. Harper, New York
5. Diefenbach GJ, Diefenbach D, Baumeister A, West M (1999) Portrayal of lobotomy in the popular press: 1935–1960. *J Hist Neurosci* 8(1):60–69
6. Diering SL, Bell WO (1991) Functional neurosurgery for psychiatric disorders: a historical perspective. *Stereotact Funct Neurosurg* 57(4):175–194
7. Feldman RP, Alterman RL, Goodrich JT (2001) Contemporary psychosurgery and a look to the future. *J Neurosurg* 95(6):944–956
8. Fram SM (2013) The constant comparative analysis method outside of grounded theory. *Qual Rep* 18(1):1–25
9. Gilbert F, Ovidia D (2011) Deep brain stimulation in the media: over-optimistic portrayals call for a new strategy involving journalists and scientists in ethical debates. *Front Integr Neurosci* 5(16):1–6
10. Johnson J (2009) A dark history: memories of lobotomy in the new era of psychosurgery. *Med Stud* 1(4):367–378
11. Gildenberg PL, Krauss JK (2009) History of stereotactic surgery. In: Lozano AM, Gildenberg PL, Tasker RR (eds) *Textbook of stereotactic and functional neurosurgery*. Springer, Berlin, pp 53–58
12. Lauber C, Nordt C, Falcato L, Rössler W (2005) Can a seizure help? The public's attitude toward electroconvulsive therapy. *Psychiatry Res* 134(2):205–209
13. Lipsman N, Bernstein M, Lozano AM (2010) Criteria for the ethical conduct of psychiatric neurosurgery clinical trials. *Neurosurg Focus* 29(2):E9
14. Lipsman N, Mendelsohn D, Taira T, Bernstein M (2011) The contemporary practice of psychiatric surgery: results from a survey of north American functional neurosurgeons. *Stereotact Funct Neurosurg* 89(2):103–110
15. Mack N, Woodsong C, MacQueen KM, Guest G, Namey E (2005) *Qualitative research methods: a data collectors field guide*. Available at: <https://www.k4health.org/toolkits/measuring-success/qualitative-research-methods-data-collectors-field-guide>. Last accessed 5 July 2017
16. McGinty EE, Kennedy-Hendricks A, Choksy S, Barry CL (2016) Trends in news media coverage of mental illness in the United States: 1995–2014. *Health Aff* 35(6):1121–1129
17. Mendelsohn D, Lipsman N, Lozano AM, Taira T, Bernstein M (2013) The contemporary practice of psychiatric surgery: results from a global survey of functional neurosurgeons. *Stereotact Funct Neurosurg* 91(5):306–313
18. Mitchell A, Gottfried J, Barthel M, Shearer E (2016) The modern news consumer. Pew Research Center. Available at: <http://www.journalism.org/2016/07/07/the-modern-news-consumer/>
19. Muller JH (1994) Anthropology, bioethics, and medicine: a provocative trilogy. *Med Anthropol Q* 8(4):448–467

20. Müller S, Riedmüller R, van Oosterhout A (2015) Rivaling paradigms in psychiatric neurosurgery: adjustability versus quick fix versus minimal-invasiveness. *Front Integr Neurosci* 9(27):1–5
21. Neumaier F, Paterno M, Alpdogan S, Tevoufouet EE, Schneider T, Hescheler J, Albanna W (2017) Surgical approaches in psychiatry: a survey of the world literature on psychosurgery. *World Neurosurg* 97:603–634
22. Nobel Foundation (1964) Nobel lectures: physiology or medicine, 1942–1962. Elsevier, Amsterdam
23. Nuttin B, Cosyns P, Demeulemeester H, Gybels J, Meyerson B (1999) Electrical stimulation in anterior limbs of internal capsules in patients with obsessive-compulsive disorder. *Lancet* 354(9189):1526
24. Nuttin B, Wu H, Mayberg H, Hariz M, Gabriëls L, Galert T et al (2014) Consensus on guidelines for stereotactic neurosurgery for psychiatric disorders. *J Neurol Neurosurg Psychiatry* 85(9):1003–1008
25. O’Reardon JP, Cristancho P, Peshek AD (2006) Vagus nerve stimulation (VNS) and treatment of depression: to the brainstem and beyond. *Psychiatry (Edgmont)* 3(5):54
26. Penfield W, Boldrey E (1937) Somatic motor and sensory representation in the cerebral cortex of man as studied by electrical stimulation. *Brain* 60:389–443
27. Pressman JD (1998) Last resort: psychosurgery and the limits of medicine. Cambridge University Press, Cambridge
28. Racine E, Waldman S, Palmour N, Risse D, Illes J (2007) “Currents of hope”: neurostimulation techniques in US and UK print media. *Camb Q Healthc Ethics* 16(3):312–316
29. Robillard JM, Lo C, Feng TL, Hennessey CA (2016) “A light switch in the #brain”: optogenetics on social media. *Neuroethics* 9(3):279–288
30. Rosin B, Slovik M, Mitelman R, Rivlin-Etzion M, Haber SN, Israel Z et al (2011) Closed-loop deep brain stimulation is superior in ameliorating parkinsonism. *Neuron* 72(2):370–384
31. Schlaepfer TE (2015) Deep brain stimulation for major depression—steps on a long and winding road. *Biol Psychiatry* 78(4):218–219
32. Schlaepfer TE, Lisanby SH, Pallanti S (2010) Separating hope from hype: some ethical implications of the development of deep brain stimulation in psychiatric research and treatment. *CNS Spectr* 15(5):285–287
33. Valenstein ES (1986) Great and desperate cures: the rise and decline of psychosurgery and other radical treatments for mental illness. Basic Books, New York
34. Valenstein ES (1997) History of neurosurgery. In: A history of neurosurgery. The American Association of Neurological Surgeons, Park Ridge, pp 499–516
35. Weiner RD, Reti IM (2017) Key updates in the clinical application of electroconvulsive therapy. *Int Rev Psychiatry* 29(2):54–62
36. Zamiska N (2007) In China, brain surgery is pushed on the mentally ill. <https://www.wsj.com/articles/SB119393867164279313>. Last accessed 23 Aug 2017

### Comments

This is a very interesting report on how scientific work surfaces to the public through the media. The authors find a shift towards a more positive tone in the news releases about psychiatric neurosurgery after the introduction of neuromodulation methods. However, data about objective results, risks and ethical concerns in those news are sometimes missing. It is our duty as neurosurgeons, and also that of journalists, to transmit the results of our research to the public in order to facilitate their widespread use, but also avoiding biases that may lead to improper expectations from potential users.

Juan Barcia  
Madrid, Spain