Neurosurgical Resident Error: A Survey of U.S. Neurosurgery Residency Training Program Directors

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CNS 2017 Annual Meeting
Boston, Massachusetts
October 7-11, 2017

Introduction

Several hundred thousand patients die each year in the U.S. from potentially preventable medical errors; resident errors are a subset of these errors and occur more frequently than is often recognized. There is currently little data describing the basis for resident error or outlining trends in resident error, particularly in the field of neurosurgery. In the present study, we query neurosurgery residency program directors across the country regarding the frequency and types of resident errors at their institutions.

Methods

An online 19-question survey was distributed to program directors of 108 U.S. neurosurgery residency training programs to assess the frequency and most common forms and causes of resident error, the resulting patient outcomes, and the steps taken by residency programs to address these errors. The questionnaire also assessed the relative effect of post graduate year (PGY) level and ACGME duty-hour restrictions on the rate of resident errors.

Table 1. Trends in Neurosurgical Resident Errors

Parameter	Number
Number of programs believing that resident PGY level affects the incidence of errors	23 (74.2%)
Number of programs believing that resident PGY year status affects the steps taken by the program to correct these errors	19 (61.3%)
Number of programs that have observed the July phenomenon	7 (22.6%)
Number of programs believing that errors are handled appropriately at their institution	30 (96.8%)
Number of programs that noted a correlation between a reduction in duty hour limitations and the incidence of resident error	2 (6.5%)
Number of programs that observed instances where residents were unjustifiably blamed for errors	19 (61.3%)
Number of programs that believe resident error is covered adequately in ACGME resident survey	17 (54.8%)
Number of programs that believe that the neurosurgery Milestone Project could reduce the incidence of resident error	11 (35.5%)

Table 2. Characterization of Neurosurgical Resident Error

Parameter	Number
Number of responses	31
Number of residents per program (median; range)[1]	14 (3-28)
Annual frequency of residents' errors (median; range)[2]	3 (1-24)
Frequency per error type (percentage; mean; range)[2]	
Procedural/Surgical Error	48.4% (10.0-100.0%)
Diagnostic Error	31.1% (0.0-80.0%)
Medical (e.g. medication) Error	20.2% (0.0-70.0%)
Frequency of errors requiring repeat surgery (percentage; mean; range)[2]	27.0% (0.0-100%)
Outcome of residents' error (percentage; mean; range)[1]	
No injury	67.0% (5.0-100.0%)
Transient injury	20.5% (0.0-60.0%)
Permanent injury	8.1% (0.0-45.0%)
Death	2.0% (0.0-12.0%)
Cause of error (percentage; mean; range)[1]	
Inexperience	45.9% (0.0-100.0%)
Resident mistake despite adequate training	35.5% (0.0-100.0%)
Lack of supervision	9.5% (0.0-70.0%)
Equipment failure	6.2% (0.0-50.0%)
Fatigue	2.5% (0.0-33.3%)
Substance abuse	0.2% (0.0-5.0%)

[1] Data is missing from 1 program
[2] Data is missing from 3 programs

Table 3. Institutional Management of Neurosurgical Resident Error

Parameter	Number
Initial steps taken by program to resolve issue with residents (number; range)	
Private one-on-one	29 (93.5%)
Tabled discussion at weekly seminar	17 (54.8%)
Review by faculty panel and meeting with resident	11 (35.5%)
Close supervision of resident	9 (29.0%)
Placement of resident on probation	1 (3.2%)
Require resident to repeat extra time	1 (3.2%)
Non-renewal of the resident/termination	0 (0.0%)
Step taken by program after repeat error (number; range)	
One-on-one remediation/counseling	22 (71.0%)
Private one-on-one	18 (58.1%)
Review by faculty panel and meeting with resident	18 (58.1%)
Close supervision of resident	17 (54.8%)
Tabled discussion at weekly seminar	8 (25.8%)
Placement of resident on probation	3 (9.7%)
Non-renewal of the resident/termination	2 (6.5%)
Require resident to repeat extra time	1 (3.2%)
Number of incidents after which residents were terminated (mean; range)[1]	2.9 (2-3)

[1] Data is missing from 20 programs

Conclusions

Procedural error was the most commonly observed form of error. PGY status is believed to be an important predictor of error frequency. Most program directors do not believe mandated reductions in duty hours has decreased the incidence of resident errors. Closer attending supervision in the OR for junior residents, and for residents in larger training programs, may be considered.

Results

Thirty-one (29%) responses were received. Procedural/surgical error was the most commonly observed type of error. Transient injury to the patient or no injury to the patient, were the two most frequent outcomes. Inexperience or resident mistake despite adequate training were cited as the most common causes of error. Thirty (97%) programs have protocols in place to encourage error reporting. Twenty-three (74.2%) programs affirmed that a lower PGY status correlated with an increased incidence of errors.

Seven (22.6%) program directors have observed the "July Phenomenon" at their institution, with only two (6.5%) reporting having noticed a correlation between a reduction in duty hour limitations and the incidence of resident error. There was a trend towards an association between an increased number of residents within a program and the number of errors attributable to a lack of supervision ($r = 0.36$; $p = 0.06$).