Neurosurgical Outcomes Research Databases: Options, Strengths, and Limitations

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Introduction

- Healthcare reform, quality, value of care, future physician reimbursement policies, and personalized patient care depend on robust data streams of demographical, clinical, and financial outcomes after neurosurgery.
- In this study, we assessed the strengths and limitations of various resources for outcomes research in neurosurgery.

Methods

- We compiled a list of datasets currently in use, and then supplemented the list with additional datasets that have not yet been used for neurosurgical research. 18 databases were identified in total.
- Variables collected included length of follow-up, number of records, availability of financial data, number of total citations to date, number of neurosurgical citations, and method of access.

Table 1: Database Characteristics

Database	Inpatient/Outpatient	Longitudinal	Patient demographics	Perioperative clinical factors	Complications	Financial data
NSQIP	Both	No	Yes	Yes	Yes	No
NTDB	Inpatient	No	Yes	Yes	Yes	No
NCDB	Both	No	Yes	Yes	Yes	No
MarketScan	Both	Yes	Yes	Yes	Yes	Yes
Premier Perspective	Both	Yes	Yes	Yes	Yes	Yes
PearlDiver	Both	Yes	Yes	Yes	Yes	Yes
PHIS	Both	Yes	Yes	Yes	Yes	Yes
SEER	Both	Yes	Yes	Yes	Yes	No
NIS	Inpatient	No	Yes	Yes	Yes	Yes
KID	Inpatient	No	Yes	Yes	Yes	Yes
SID	Inpatient	Yes	Yes	Yes	Yes	Yes

Abbreviations: KID: Kids Inpatient Database; NCDB: National Cancer Database; NIS: National Inpatient Sample; NSQIP: National Surgical Quality Improvement Program; NTDB: National Trauma Data Bank; PHIS: Pediatric Health Information System; SEER: Surveillance, Epidemiology, and End Results; SID: State Inpatient Database

Results

- The number of unique patients contained within each dataset ranged from 7300 (N2QOD – National Neurosurgical Quality and Outcomes Database) to 180 million (MarketScan).
- The SEER (6063 overall citations, 72 neurosurgery citations) and NIS (2254 overall citations, 124 neurosurgery citations) databases were most frequently used for outcomes research in neurosurgery.
- By year of oldest citation in neurosurgery, SEER (1981) is the oldest and N2QOD (2013) is the newest.
- In the pediatric neurosurgery literature, KIDS (401 overall citations, 29 neurosurgery citations) is the most frequently used.
- The method of access varied from free access for reporting institutions (PHIS) to application and small financial fee ($350 per year for 2007-2013 NIS) to substantial fees ($51,000 for multi-study access to 5 years of data in MarketScan).

Conclusions

- Multiple options exist for neurosurgical outcomes research with varying lengths of follow-up, data completeness, clinical relevance to neurosurgery, and prior research utilization.
- With the ongoing trend of building neurosurgery-specific registries like N2QOD, large national databases will be a central tool in the future development of neurosurgery outcomes research.

Learning Objectives

1) Understand key strengths and limitations of major national outcomes databases
2) Recognize potential of national outcomes databases for healthcare reform, quality improvement, future reimbursement policies, and personalized patient care
3) Discuss future applications of big data and machine learning to neurosurgical outcomes research

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