Does Improving Medical Record Documentation Better Reflect Severity of Illness in Neurosurgical Patients?

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Physician documentation in the medical record is essential for communicating the clinical status and care plan to other healthcare providers. The medical record also serves as a medicolegal document to protect the physician should medical malpractice be alleged. In addition to these uses, documentation of patients' diagnoses and procedures is used by hospital coders to calculate severity of illness (SOI) and risk of mortality (ROM) ratings. A rating given from level 1 to 4 (4 being most severe), SOI reflects a patient's degree of physiological illness. Also scored from 1 to 4, ROM is a gauge of the patient's risk of death while in the hospital on the basis of the patient's diagnoses (Table 1).

Both SOI and ROM have significant roles in healthcare economics. Hospital reimbursement depends in part on SOI. The Centers for Medicare and Medicaid Services (CMS) is the entity of the federal government that is responsible for healthcare financing, coverage, and payment of Medicare and Medicaid beneficiaries. Formerly known as the Health Care Financing Administration, CMS adopted diagnosis-related groups (DRGs) in 1983 after their development at Yale University in 1970. Their purpose was to replace the traditional per-diem method of hospital reimbursement. Per diems were cost based and characterized as an undifferentiated patient day regardless of patient illness. In contrast, each DRG classification represents similar resource consumption and length-of-stay patterns so that reimbursement is based on these expectations. In 2008, the CMS went one step further and added a severity-adjusted version to the original DRGs called Medicare-severity DRG.[1] The severity adjustment takes into account the patient's SOI and is now used by the Medicare Inpatient Prospective Payment System.

The SOI and ROM scores are also being used to gauge quality control issues. Data for every Medicare inpatient stay are maintained in the Medicare Provider and Analysis Review file.[2] Quality improvement organizations contracted by CMS to provide quality oversight to Medicare providers use the data to assess potential problems with noncompliance. Additionally, these organizations analyze a facility's Medicare-severity DRG mix to look for problems with hospitals that may potentially always code for higher-weighted DRGs and appear as outliers compared with other similar facilities.[3]

Finally, ''quality of care'' assessments use SOI and ROM. Mortality rates vary between providers and hospitals; the presumption is that after controlling for patients' severity of illness, residual differences in mortality rates relate to differences in quality of care. Corporations such as Thompson Reuters have created a marketing tool and ''status'' based on this information that hospitals may strive to achieve. The well-known ''Top 100 Hospitals''[4] lists the 100 ''best'' hospitals across the country in a given specialty line. When the results of the Hospital Consumer Assessment of Healthcare Providers and Systems survey[5] are compared between winners of the Top 100 Hospitals award and nonwinners, the award winners do slightly better than nonwinners on all survey items that showed modest but statistically significant differences between the 2 groups.[6] These findings suggest that marketing tools such as the Top 100 Hospitals might play a role in consumer perception, assessment, and decision making. All-patient–refined DRGs (APR-DRGs) are another mode for comparison. Trademarked by 3M, APR-DRGs classify all inpatient admissions based on the SOI and ROM levels represented by *International Classification of Disease*, ninth revision (ICD-9), codes. Institutions such as the Agency for Healthcare Research and Quality are using APR-DRGs for quality monitoring purposes, especially for severity adjustment of mortality rates.[1]

The SOI and ROM are derived from documentation of patients' diagnoses and comorbidities.[1,7] Errors in documentation can lead to overestimation or underestimation of expected mortality, which has an effect on an institution's comparison with other hospitals.[8,9] Furthermore, neurosurgeons contribute significantly to hospitals' financial health.[10,11] Better documentation of admitting diagnoses and comorbidities should enable more accurate ICD-9 coding, which in turn should lead to more accurate calculation of SOI and ROM.

The rationale for the study stemmed from a need for resident participation in a quality improvement project, a requirement dictated by the Accreditation Council of Graduate Medical Education.[12] Before the project, a preliminary review of progress notes on the neurosurgery service by one of the authors (N.S.L.) indicated suboptimal

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TABLE 1. Severity of Illness and Risk of Mortality Grading Systems

Number	Classification
1	Minor
2	Moderate
3	Major
4	Extreme

documentation of patient comorbidities. The objective of this study was to determine whether interventions designed to effectively improve physician clinical documentation would subsequently lead to increased capture of SOI and ROM. A secondary aim of the project was to simultaneously provide residents with a quality improvement opportunity. We hypothesize that the multimodality interventions that improve neurosurgeons' clinical documentation lead to better characterization of SOI and ROM.

MATERIALS AND METHODS

Documentation Improvement Interventions

Before data collection, 3 specific interventions were used to educate physicians with the goal of improving medical record documentation as part of the master's thesis of one of the authors (C.H.). These modalities included the following: group in-service, development and use of a progress note template, and concurrent medical record coder review and feedback to the physician during the patients' in-hospital stays.

Faculty and residents in the Division of Neurological Surgery at University of Missouri Hospitals and Clinics participated in a 30-minute in-service on coding, SOI, and ROM. A new neurosurgery progress note template (Figure 1) was introduced, and instructions for its use were provided. The template was organized to include comorbidities listed as ICD-9 codes and grouped into organ system for ease of location.

Mechanisms for queries to the physicians from the nurse reviewer and appropriate responses were explained to the group. Informed consent was obtained from the participating physicians. The study was approved by the Health Sciences Institutional Review Board.

After the in-service, a nurse-reviewer (working in the capacity of assistant manager of medical records) began random review of neurosurgical patient records. Random record review was performed 2 to 3 times per week, averaging 10 to 15 h/wk, while patients were still hospitalized to look for potential diagnoses that were not appropriately documented. Charts for review were chosen at random; however, intensive care unit patients were given priority for review over floor patients. Information gathered was kept on a worksheet (Figure 2), and cases for which questions existed were e-mailed to the physicians with a copy to the senior author (N.S.L). A typical query follows: ''Patient X, MNICU 13, had a 3400cc EBL during OR, and received several units of PRBCx and FFP. H&H dropped from 12.1/35.2 to 5.9/17. Would a secondary diagnosis of acute blood loss anemia be appropriate? If so, please document in the progress notes.''

Follow-up on queries was completed to determine whether the physician had documented the diagnosis in question. If no response was made, a second e-mail was sent. In cases when the patient had been discharged and confirmation or disagreement with the query was not documented in the progress notes as requested, an e-mail notification was sent, asking the physician to address the query in the discharge summary. This method of review, queries by e-mail, and rereview occurred for 8 weeks.

Data Collection

All neurosurgery service adult in-patient charts at University of Missouri Hospital and Clinics were retrospectively reviewed from 3 time intervals. June 2004 to December 2004 represented the preintervention period. August 2007 to December 2007 was the time period during active educational intervention. Finally, June 2008 to December 2008 represented the post-intervention period. Data collected included patient age, sex, ICD-9 diagnoses, raw patient mortality, SOI, and ROM. Patients younger than 18 years of age at the time of admission were excluded. Versions 24 and 25 of the 3M APR-DRGs[13,14] were used to calculate ROM and SOI. Preliminary data were pulled from each time period and analyzed according to the description below. From the results of the preliminary data analysis, the standard deviation for the SOI and ROM outcomes was estimated to be about 1.0 units. It was determined that sample sizes of 300 patients per time period would give well over 80% power for detecting differences in mean scores of 0.25 units. The estimated power was found using the POWER procedure in SAS version 9 (SAS Institute Inc, Cary, North Carolina).

Data Analysis

The outcomes of mortality, SOI, and ROM can all be influenced by a patient's age, sex, and primary diagnosis. Consequently, analyses were done to determine whether any of these variables differed between time periods. Furthermore, these variables were considered covariates when testing the primary outcomes for differences between time periods. Primary diagnoses were grouped into 9 categories based on ICD-9 codes as follows: malignant neoplasms, benign neoplasms, nervous system disorders, cardiovascular disease, musculoskeletal disorders, skull/spine injuries, brain contusions, complications, and other diagnoses. The Kruskal-Wallis test was used to test for differences in age between time periods. Sex differences were assessed with a χ^2 model. Stratification or adjustment for differences in age and sex was performed with the Cochran-Mantel-Haenszel test. For the prediction of the probability of

Neurosurgery Progress Note

University of Missouri Health Sciences Center

Label Here

NEUROSURGERY PROGRESS NOTE

Date: August 19, 2007 Time: _____ Hospital Day: __________________

Post-Op Day: __________________ Procedure: __________________

COMMENTS/EVENTS/PROCEDURES in the last 24 hours:

SUBJECTIVE:

OBJECTIVE: VS: TMax: ________ TCurrent______ BP: ____________ HR: __________ RR:[redacted]__________ SaO2: _____

I/O: ________________ / ______________________________ UOP ______________

DIET: Blood Glucose: ________________ Activity: ________________

PHYSICAL EXAM: General: ____________________________ ENT: ____________________________

Neuro: GCS Score______ Mental Status: __________________ Motor: ______________ Pupils: ______________

Other neuro findings__________________________ CV/Resp: ____________________________

GI: ___________ Incision(s)/Wound(s): ____________________ Extremities: ____________________

LABS:

Studies: ____________________________________

DIAGNOSES/PROBLEMS:

Hemato-vascular
- ☐ Acute Blood Loss Anemia
- ☐ Pancytopenia
- ☐ Chronic Blood Loss Anemia
- ☐ Coagulopathy ☐ DVT
- ☐ Post-Op Hemmorhage

Cardiac
- ☐ Acute MI
- ☐ Atrial fibrillation ☐ Atrial Flutter
- ☐ CAD ☐ Stable Angina ☐ Unstable Angina
- ☐ Cardiogenic Shock

Infectious
- ☐ Aseptic meningitis
- ☐ Bacteremia ☐ Cellulitis
- ☐ Bacterial meningitis
- ☐ Pneumonia ☐ UTI
- ☐ Wound Infection
- ☐ Septic Shock
- ☐ Sepsis, organism________
- ☐ Post-Op Fever

Cranio-cerebral
- ☐ Cerebral Infarction
- ☐ Cerebral ischemia
- ☐ Cerebral Vasospasm
- ☐ Hydrocephalus
- ☐ Increased intracranial pressure
- ☐ Intracranial hemorrhage
- ☐ Subdural fluid collection
- ☐ Post-Op CSF Leak
- ☐ Elevated ICP

Gastrointestinal
- ☐ GI Bleed ☐ Melena
- ☐ Hematemesis
- ☐ Constipation ☐ Ileus
- ☐ Diarrhea

Genito-Urinary
- ☐ Renal Failure
  - ☐ Acute ☐ Chronic
- ☐ Urinary Retention
- ☐ Hematuria

Fluid/Electrolytes/Metabolic
- ☐ Dehydration/Volume Depletion
- ☐ Diabetes Insipidus
- ☐ DM Type I ☐ DM Type II
  - ☐ Controlled ☐ Uncontrolled
- ☐ Hypercalcemia
- ☐ Hypocalcemia
- ☐ Hyperglycemia
- ☐ Electrolyte Imbalances
- ☐ Fluid Overload
- ☐ Hyperkalemia
- ☐ Hypokalemia
- ☐ Hypertension
- ☐ Hypomagnesemia
- ☐ Hyponatremia
- ☐ Hypophosphatemia
- ☐ Metabolic Acidosis
- ☐ Metabolic Alkalosis
- ☐ Pregnancy
- ☐ Decubitus Ulcer

Neuro-Psych
- ☐ Depression
- ☐ Substance Abuse
- ☐ Seizure ☐ Myopathy
- ☐ ETOH - withdrawal
- ☐ Dilantin toxicity

Pulmonary
- ☐ ARDS ☐ SIRS
- ☐ Atelectasis ☐ CHF
- ☐ COPD ☐ COPD flare
- ☐ Pleural Effusion
- ☐ Pneumothorax
- ☐ Pulmonary Embolus
- ☐ Respiratory Acidosis
- ☐ Respiratory Alkalosis
- ☐ Respiratory Failure
  - ☐ Acute ☐ Chronic
- ☐ ________________

ASSESSMENT / PLAN (include a treatment plan for each diagnosis checked):

Name: Signature: Beeper #:

Attending Attestation Date: ________ / Time: ________

☐ Patient was discussed with the house staff. I have reviewed the history, examination, assessment, and plan and I concur.

Name: Signature: Beeper #:

FIGURE 1. Neurosurgery progress note.

Clinical Documentation Review Tool

Clinical Documentation Review Tool
For Potential Missed Diagnoses

MRN: ______________________ DOS ____________________

DRG: ______________________ Description: _________________

Primary Dx: __________ ______________________
Code description

Primary Procedure: __________ ___________________
Code description

Review chart for the following:

1. Any procedure codes listed that could potentially indicate a CC diagnosis-i.e. transfusions, cultures, etc….?
   Yes ________________________
   No
2. Review discharge summary for any potential diagnoses not coded.
   Yes ________________________
   No
3. Review H&P for any potential missed comorbidities.
   Yes ________________________
   No
4. Review the physician's orders for treatments, medications, lab work, etc… that may indicate a secondary dx. Circle if any of the following were administered:
   fluid boluses   MG/K boluses
   IV Lasix   Foley insertion
   blood/urine/sputum cultures   xrays
   chest tube placement   IV albumin, etc…
   other___________________________
5. Review progress notes to check for documentation of reason for any of the above orders you may find. Does the documentation support a diagnosis for the treatment administered?
   Yes________________________
   No

Review Findings

☐ No missed diagnoses, no missing documentation.

☐ A secondary diagnosis was [redacted] adequate documentation was present.

☐ A potential secondary diagnosis was identified, but [redacted] enough for proper coding.

____

FIGURE 2. Clinical documentation review tool.

occurrence of mortality, logistic regression was used. Finally, the cumulative logit model was used to analyze SOI and ROM, taking into account differences in primary diagnoses over time. The SAS Analytical Software version 9.0 was used for the analysis. In view of the fact that preliminary data were reanalyzed, allowing 2 opportunities to reject the null hypothesis of no group differences, only values of $P < .01$ were considered significant.

RESULTS

Chart Review Intervention

During the 8-week period of chart review, 53 inpatient charts were reviewed. A total of 99 reviews were completed in total, with 41 queries sent to physicians (41%). All but 2 queries were sent via e-mail. Sixteen second-request queries were sent. Twenty queries (53%) were agreed on and documented in the record. A physician disagreed with 1 query, so no change in documentation was made, and 17 queries yielded no response (44.7%).

SOI/ROM Values

Over the 3 time periods, 1009 cases were analyzed: 329 patients during the preintervention period, 306 patients during the intervention period, and 374 patients during the postintervention period. The simple mean values of SOI in the 3 time periods were as follows: 1.72 before intervention, 1.69 during intervention, and 1.82 after intervention ($P = .09$, χ^2). Simple mean values of ROM in each time period were 1.40, 1.43, and 1.56 respectively ($P = .02$, χ^2), with mortality rates of 6.38%, 3.59%, and 5.61% respectively ($P = .27$, χ^2). Raw data results are summarized in Table 2.

Effect of Age and Sex on SOI and ROM

Mean patient age differed significantly between time periods: 48.3 years of age before intervention, 52.1 years of age during intervention, and 53.1 years of age after intervention ($P = .001$, Kruskal-Wallis). Accounting for differences in age did not affect SOI ($P = .24$), ROM ($P = .48$), and raw mortality ($P = .06$, Cochran-Mantel-Haenszel). Sex distributions were similar in each time period ($P = .64$, χ^2).

Effect of Diagnosis

The distribution of diagnoses in each time period is shown in Table 3. Primary diagnosis did not differ significantly between the preintervention and intervention time periods ($P = .13$), even when adjusted for age and sex ($P = .28$, Cochran-Mantel-Haenszel). However, when the preintervention and intervention periods were combined and compared with the postintervention period, differences in diagnoses were noted ($P < .001$, Cochran-Mantel-Haenszel).

In an effort to account for differences in diagnoses, a statistical compromise had to be achieved between not using primary diagnoses as a covariant and using them with a large number of categories. Therefore, 3 categories were established on the basis of the diagnosis frequency: cardiovascular disease (32 deaths), brain contusion (6 deaths), and other (15 deaths). After diagnosis differences (3 categories) were accounted for with logistic regression, no differences in mortality rate were found between the postintervention period and either the intervention ($P = .08$) or preintervention ($P = .15$) period. No significant differences between preintervention and postinterventional periods for SOI ($P = .29$) or ROM ($P = .48$) were present when differences in diagnoses were accounted for (cumulative logit model).

DISCUSSION

Overall, we expected SOI to be lower during the preintervention period and the ROM modified by SOI to be lower during the intervention and postintervention periods. However, despite interventions such as educational in-service, progress note template, and reminders about the possibility of addending progress notes, no differences in SOI or ROM were present during active intervention or in the period after intervention. The lack of impact of intervention on SOI and ROM was not affected by the differences in age or diagnoses present among the 3 time periods.

Other studies have shown success with progress note templates. Grogan et al[15] focused on improvements to physician documentation and evaluated the effectiveness in terms of ICD-9 coding, APR-DRG, DRG weight, and University Healthcare Consortium–predicted mortality. A progress note template included a section developed by coding specialists with 40 of the most common general surgery comorbidities and complications (in check-box format). A significant increase was found in total ICD-9 codes, template-specific ICD-9 codes, APR-DRG, DRG weight, and University Healthcare Consortium–predicted mortality. Sprtel and Zlabek[16] also showed success with the

TABLE 2. Summary of Raw Data[a]

Period	n	Variable	Mean
Preintervention	329	Age	48.29 y
		Sex, F/M	157/172
		SOI	1.72
		ROM	1.40
		Deaths	6.38%
During intervention	306	Age	52.18 y
		Sex, F/M	151/155
		SOI	1.69
		ROM	1.43
		Deaths	3.59%
Postintervention	374	Age	53.05 y
		Sex, F/M	171/203
		SOI	1.82
		ROM	1.56
		Deaths	5.61%

[a]ROM, risk of mortality; SOI, severity of illness.

TABLE 3. Distributions of Diagnoses Between 3 Time Periods

Category	Preintervention	During Intervention	Postintervention	Total
Other, n	4	6	4	14
%	1.22	1.96	1.07	
Malignant neoplasms	21	27	50	98
%	6.38	8.82	13.37	
Benign neoplasms	24	22	38	84
%	7.29	7.19	10.16	
Nervous system	41	31	62	134
%	12.46	10.13	16.58	
Cardiovascular disease	27	40	38	105
%	8.21	13.07	10.16	
Musculoskeletal	103	105	139	347
%	31.31	334.31	37.17	
Skull/spinal injury	37	22	11	70
%	11.25	7.19	2.94	
Brain contusion	34	31	16	81
%	10.33	10.13	4.28	
Complications	38	22	16	76
%	11.55	7.19	4.28	
Total	329	306	374	1009

implementation of a progress note template in conjunction with a brief documentation lecture. Their results showed an absolute increase in the highest code by 14.5%, increased billable income by $10 385, and improved resident awareness of documentation.

A number of interventions for improvement in documentation and assessment end points have been suggested. Marco and Buchman[17] noted that simply asking for private commitment to change can yield measurable results. They obtained in writing acknowledgement that improvement in documentation was necessary and noticed that the acknowledging physicians showed improvement in the percentage of cases with the required documentation over time. As-Sanie et al[18] had success with obstetrics/gynecology residents after providing individual instructional sessions with faculty on coding and documentation, whereas Lemen[19] also showed success within the same specialty with the assistance of an online module. At the other end of the spectrum, Tinsley[20] described the use of a whole multidisciplinary team to improve documentation among psychiatry residents. The team met regularly to clarify resident charting responsibilities, to make the inpatient record a better communication tool, and to consider the various causes of charting deficiencies. Improvement in charting 4 of 5 items (admission note, an off-service note, descriptions of medication changes, daily progress notes, and the name and discipline of the individual recording these items) improved significantly after 1 month of intervention and was maintained at 6 months. Table 4 summarizes these intervention results.

Time is likely necessary to establish educational interventions that generate long-lasting habits in physicians and improve documentation. Relationships are present between repetition and automaticity of such habits. For instance, in 1 study,[33] 82 mostly postgraduate students were asked to choose a healthy eating, drinking, or exercise behavior to convert into a daily habit. A self-report habit index[34] was used to quantify habit strength. During 12 weeks of active study, 48% of participants reached levels thought to be consistent with habit formation. Further analysis concluded that the time needed for participants to reach 95% of their automaticity ranged from 18 to 254 days (mean, 64 days). The 8 weeks of active intervention in this study may not have been sufficient to allow documentation habits to form fully. Furthermore, educators must also question whether the amount of time required to learn simple habits differs from more complex habits requiring additional planning. Verplanken[35] showed that when repetitions are limited, a simple behavior had a higher habit score than a complex behavior. Physician documentation in the setting of demanding schedules and the intricacies of medical coding likely falls into the category of a complex habit. Therefore, physicians' documentation habits promoting better documentation may be on the longer end of the 18- to 254-day spectrum. The effect the number of daily repetitions plays on the time to automaticity is also unclear.

This study illustrates other difficulties that may hamper improvement in documentation. Physicians did not respond to 44.7% of queries with suggested documentation changes. The physicians would often not be able to check their e-mail until late in the day or evening, and paper-based progress note templates were not readily available. Additionally, some physicians may have felt that creating an addendum or new note in the electronic medical record for the sole purpose of responding to a query was too time-consuming given their other responsibilities. A more efficient mechanism of review and physician feedback could have led to an increase in adjustments in the medical record.

Searching through electronic and paper medical records looking for diagnoses that were treated and not appropriately documented is a time-intensive process. Over the 8 weeks of the intervention period, 99 reviews on 53 charts were completed. Therefore, of the 132 total neurosurgical admissions during the 8-week period, only 40.2% of them were reviewed at least once during their admission. For adequate review and feedback, more nurse-reviewer hours might be required to review a larger proportion of inpatient charts before significant results can be achieved.

Another limitation in improving documentation could be that the progress note template was inadequate. Our progress note was adapted from Grogan et al[15]; it was modified by a multidisciplinary team, including the division chief of neurosurgery, neurosurgical residents, and the assistant manager of medical records, to include complications and comorbidities typical of

TABLE 4. Summary of Literature Review[a]

Author	Year	Facility Type	Clinical Area	Level of Evidence: US Preventive	Level of Evidence: AHRQ	Educational Interventions
As-Sanie et al[18]	2005	Ambulatory teaching clinic	OB/GYN	II-3	III	Individual instructional sessions with faculty
Lemen[19]	2005	Teaching clinics	OB/GYN	II-3	III	Online module
Rose et al[21]	2000	Teaching hospital	Family medicine	II-3	III	Educational curriculum
Rose et al[22]	2001	Ambulatory teaching clinic	Family medicine	II-3	III	Progress note template
Tinsley[20]	2004	Inpatient academic hospital	Psychiatry	II-3	III	Educational program created by multidisciplinary team.
Friedman et al[23]	1996	Osteopathic hospital	Osteopathy admitting hospital examinations	II-3	III	Instructional video
Grogan et al[15]	2004	Teaching hospital, inpatients	General surgery	II-3	III	Progress note template
Trawick et al[24]	1991	Teaching hospital, ''Eye Foundation''	Ophthalmology surgical cases in hospital	II-3	III	Distributed documentation handbooks
Sprtel and Zlabek[16]	2005	Lutheran medical center (with residents)	Internal medicine inpatient admissions	II-3	III	H&P template Brief lecture
Marco and Buchman[17]	2003	Teaching hospital	Ambulatory surgery-hospital	II-3	III	Written commitment agreeing that a change is necessary
Oldfield[25]	2007	Inpatient Canadian hospital	Inpatients	III	V	Education at staff meetings Review and feedback
Cole et al[26]	1998	Hospital for special surgery	Orthopedics	III	V	Physician-targeted course
Noller[27]	2000	Large private hospital	Inpatients	III	V	Education at staff meetings Coding information newsletter Development of coding guidelines via ad hoc committees
Danzi et al[28]	2000	Large teaching hospital	Inpatients	III	V	Education at staff meetings Review and feedback
Hicks and Gentleman[29]	2003	Private hospital	Inpatients	III	V	Education at staff meetings Review and feedback
Anonymous[30]	1997	Teaching hospital	Inpatient	III	V	Review and feedback Coders rounding with physicians
Macdonald[31]	1999	N/A	Inpatient	III	V	Education at staff meetings eared educational content specific to specialty
Nicolaou and Turville[32]	1996	Teaching hospital (Australia)	Inpatient	III	V	Geared educational content specific to specialty Demonstration of coding software

[a]AHRQ, Agency for Healthcare Research and Quality; H&P, history and physical.

neurosurgical patients. No prior studies were conducted to validate the efficacy of the template in capturing accurate diagnoses.

Even if the educational interventions sufficiently improved medical record documentation, SOI and ROM may not have differed between the 3 time periods for other reasons. This study did not assess the skill level and experience of the medical coders. Medical coders are bound by official guidelines to instruct them on what they can and cannot assign codes to. However, a specialized skill set is required to review records thoroughly and to understand the clinical relationships between various conditions and common complications associated with specific procedures, which, for the experienced coder, leads to anticipating what documentation to look for. Documentation of comorbidities and complications on a progress note template might provide more thorough documentation but not necessarily more accurate coding.[22]

One must also consider whether ICD-9 codes are appropriate for determining SOI and ROM. Researchers have found inconsistent measures of accuracy in ICD-9-CM codes, depending on the diagnoses and populations being studied.[25,36-41] After a review of medical records from > 200 hospitals, Fisher et al[36] concluded that ICD-9-CM coding of principal diagnosis had an overall error rate of approximately 22% compared with structured medical record review. Birman-Deych et al[42] studied the accuracy of ICD-9-CM codes for identifying cardiovascular and stroke risk factors. Overall, in 23 657 Medicare beneficiaries, the specificity of ICD-9-CM codes was excellent, whereas the sensitivity ranged from only poor to moderate.

Despite the skepticism surrounding ICD-9 data to accurately reflect true illness, other studies have shown that these automated systems can accurately track trends. Such accuracy is evident in tracking disease surveillance and outbreak data.[43-45] For instance, Miller et al[45] and the Minnesota Department of Health found that an influenzalike illness grouping of ICD-9 data from a health maintenance organization in the Minneapolis-St. Paul area correlated with reported deaths from pneumonia and influenza. Although ICD-9 codes have been found in certain areas of disease surveillance to be adequate for tracking trends, it is not known whether the same can be assumed for using ICD-9 codes to accurately calculate trends of SOI and ROM.

CONCLUSIONS

Interventions to improve documentation by physicians failed to change SOI or ROM scoring in patients on a neurosurgical service. Either these interventions were insufficient to make a difference, or professional coders require a certain amount of experience and training to become highly proficient at anticipating what documentation to look for. Facilities wishing to improve their quality ratings in relation to SOI and ROM must be willing to devote adequate time and resources to the project. Because of the importance of these measures, physicians should play an active role in the continued development and evaluation of educational models. Addressing factors such as designated support staff, efficient physician feedback system, and chart review including all patients on the inpatient service may lead to a more successful medical record documentation.

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