



Original Article

MedCDI: A technology-based documentation and quality improvement initiative in neurosurgery

Mokshal H. Porwal¹, Christina N. Feller¹, Devesh Kumar¹, Julie Kolinski², Grant P. Sinson¹

Departments of ¹Neurosurgery and ²Medicine, Medical College of Wisconsin, Milwaukee, Wisconsin, United States.

E-mail: *Mokshal H. Porwal - mporwal@mcw.edu; Christina N. Feller - cfeller@mcw.edu; Devesh Kumar - dkumar@mcw.edu; Julie Kolinski - jkolinski@mcw.edu; Grant P. Sinson - gsinson@mcw.edu



***Corresponding author:**

Mokshal H. Porwal,
Department of Neurosurgery,
Medical College of Wisconsin,
Milwaukee, Wisconsin, United
States.

mporwal@mcw.edu

Received : 13 May 2022

Accepted : 02 June 2022

Published : 23 June 2022

DOI

10.25259/SNI_454_2022

Videos available on:

www.surgicalneurologyint.com

Quick Response Code:



ABSTRACT

Background: Clinical documentation of patient care alters coding accuracy of Medicare Severity Diagnosis-Related Groups (MS-DRGs), expected mortality, and expected length of stay (LOS) which impact quality metrics. We aimed to determine if neurosurgical quality metrics could be improved by facilitating accurate documentation and subsequently developed a mobile application and educational video to target areas of opportunity.

Methods: Vizient software was used to analyze MS-DRGs and expected LOS for sample of patients requiring surgery for spinal pathology, brain tumors, and subarachnoid hemorrhage (SAH) between January 2019 and August 2021. Chart reviews were conducted to discover variables missed by documenting provider and/or coder.

Results: Review of 114 spinal surgeries, 20 brain tumors, and 53 SAH patients revealed at least one additional variable impacting LOS in 43% of spine, 75% of brain tumor, and 92% of SAH patients, with an average of 1 (1.25), 2 (1.75), and 3 (2.89) new variables, respectively. Recalculated expected LOS increased by an average of 0.86 days for spine, 3.08 for brain tumor, and 6.46 for SAH cases.

Conclusion: Efforts to accurately document patient care can improve quality metrics such as expected LOS, mortality, and cost estimates. We determined several missing variables which impact quality metrics, showing opportunity exists in neurosurgical documentation improvement. Subsequently, we developed an educational video and mobile-supported application to specifically target these variables. To the best of our knowledge, this represents the first initiative to utilize the proven powers of mobile phones in health care toward the novel application of specifically improving neurosurgical quality metrics.

Keywords: Brain tumor, Documentation improvement, Mobile application, Quality metrics, Spine, Subarachnoid hemorrhage

INTRODUCTION

Quality metrics are closely tracked within hospital systems due to their effect on revenue, hospital expansion, relative hospital performance, and trust in the health-care team. Clinical documentation of patient care alters the coding accuracy of Medicare Severity Diagnosis-Related Groups (MS-DRGs), expected length of stay (LOS), expected mortality, and expected costs. These factors are used to code quality metrics which can impact physician and medical center profiling, quality reporting, and revenue. Consequently, surgeons face increasing pressure to improve these metrics in their patient population. However, it can be difficult to accurately document all major factors due to poor data accessibility and ease of interpretation by providers

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, transform, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2022 Published by Scientific Scholar on behalf of Surgical Neurology International

and coders, along with requiring effortful behavioral changes by multiple stakeholders.^[6] Therefore, observed quality metrics are sometimes worse than expected calculations, reflecting poorly on the value of care provided.

Improving hospital-wide quality metrics such as mortality index (the observed to expected mortality ratio) can be greatly impacted by high-acuity departments such as neurosurgery.^[7] The previous studies in neurosurgical departments have had great success in improving quality metrics by addressing clinical documentation.^[8,11] However, quality improvement in large institutions has no one-size-fits-all solution due to the different personalities and approaches among teams, service lines, and departments. Generic educational sessions and printed material only capture limited attention and motivation from providers and have been shown to poorly influence provider practices and patient outcomes.^[2,3] Therefore, effectively improving quality metrics through clinical documentation require a more engaging and user-friendly modality. The importance of this issue is highlighted by the increasing worldwide and multidisciplinary efforts to implement and improve clinical documentation improvement programs.^[6,12,13]

In this initiative, we aimed to determine if neurosurgical quality metrics could be improved by facilitating clinical documentation using toolkits that have multiple modalities of support. Initially, we aimed to retrospectively determine commonly missed variables within documentation. Subsequently, we aimed to develop a toolkit consisting of an educational video along with a mobile application. This technology-based approach provides the benefit of increased engagement, customized interventions, user convenience, and dynamic real-time updates.

MATERIALS AND METHODS

Vizient is the largest health-care performance company that tracks data from over 97% of the US academic medical centers and 600 community hospitals. To create a technology-based quality improvement toolkit, we first developed a 2 min video animation to provide an overview of the role of clinical documentation improvement, coding, Vizient, and a demonstration of the proposed mobile application. We provided this animation to providers for input to assess educational value and effectiveness. We then initiated department specific interventions based on provider preferences and needs. First, specific diagnoses were identified that were being treated but not documented in a way that could be captured by coding. For example, cases of “coma” documentation cannot only include the total Glasgow Coma Scale score, rather it requires each subsection score to show accurate severity of illness. The Vizient Clinical Data Base was utilized with permission of Vizient, Inc. (All rights reserved.) to target areas of opportunity, by MS-DRG, for

expected LOS. Retrospective chart reviews based on these targets were conducted to identify high-yield variables for providers to focus on, some of which were documented but not delineated as present on admission. MS-DRGs and expected LOS were analyzed from the clinical database for a sample of 114 spine, 20 brain tumors, and 53 subarachnoid hemorrhage (SAH) patients over the span of January 2019 to August 2021. Chart reviews for all procedures were conducted to search for variables missed by the documenting provider or coder that impact LOS. Expected LOS was recalculated for every procedure, accounting for the missed variables discovered during chart review. Of note, variables are groupings of International Classification of Diseases Tenth Revision (ICD-10) codes that based on risk stratification impact quality metrics including expected LOS, mortality, and cost. If any one ICD-10 code within each grouping is identified, the associated variable is assigned to the patient encounter.

By utilizing department feedback and retrospective clinical data, a Progressive Web Application (PWA) was created with variables divided by procedure and included variable definitions when necessary. A PWA allows seamless access through any device with an internet connection including computers, mobile phones, and tablets. Within this PWA, expandable descriptions for each variable allow the provider to understand what to document for each patient.

Ethics statement

IRB and ethics committee approval were not required for this study since it is classified as nonhuman research for quality improvement. Similarly, patient consent was not required since data collected pertain only to quality metrics assessment without any identifiable patient data or interventions affecting patient care.

RESULTS

Chart reviews of 114 spinal surgeries, 20 brain tumors, and 53 SAH patients revealed at least one additional variable contributing to expect LOS in 43% of spine, 75% of brain tumor, and 92% of SAH patients. An average of 1 (1.25), 2 (1.75), and 3 (2.89) new variables was found which impact expected LOS in spine, brain tumor, and SAH patients, respectively. Expected LOS, recalculated with previously undocumented variables, increased by an average of 0.86 days for spine cases, 3.08 days for brain tumor cases, and 6.46 days for SAH cases. The greatest increase in expected LOS was 7 days for spine, 32 days for brain tumor, and 72 days for SAH patients when accounting for undocumented risk factors. The most common variable categories missed for each group are shown in Table 1. Exact variables missed were categorized into larger groups to preserve the proprietary nature of Vizient variable data.

Table 1: Missed variables categories impacting length of stay.

	Count
Spine (n=114)	
Fluid, nutritional, and electrolyte variables	39
Cardiovascular	29
Hematologic	15
Spinal disorders and procedures	13
Pulmonary	8
Chronic fatigue conditions	7
Psychiatric	7
Admission source and status variables	6
Trauma and relevant complications	6
Renal	5
Cancer and neoplasms	4
Gastrointestinal and hepatobiliary	3
Infectious disease	2
Substance abuse	1
Socioeconomic	1
Subarachnoid hemorrhage (n=53)	
Fluid, nutritional, and electrolyte variables	28
Ventricular procedures	17
Stroke and sequelae	15
Socioeconomic	12
Pulmonary and ventilation variables	10
Neurological	8
Aneurysms	7
Psychiatric	5
Cardiovascular	4
Hematologic	3
Gastrointestinal and hepatobiliary	2
Level of care information	2
Infectious disease	1
Shock	1
Brain tumor (n=20)	
Fluid, nutritional, and electrolyte variables	12
Cardiovascular	5
Chronic fatigue conditions	3
Neurological	3
Gastrointestinal and hepatobiliary	2
Substance abuse	2
Hematological	2

A 2 min educational video animation was created based on department feedback ([Video 1], which shows the full animated video). In addition, an overview of the mobile application to facilitate neurosurgical documentation is shown in Figure 1.

DISCUSSION

The previous research shows that quality metrics in neurosurgery, such as mortality index, are often not capturing reality and such a problem needs to be addressed.^[5] Furthermore, studies have had success by utilizing educational presentations, pocket reference cards, precoder, and documentation teams.^[8,14,16] While these interventions show a

proven method of improving quality metrics, there are several improvements needed such as convenience, opportunity for real-time data updating, and increased time efficiency. A recent study by Kessler *et al.* showed success by utilizing a spreadsheet tool which answers some of these concerns.^[8] In addition, the use of technology and mobile phones has been proven to be impactful in enhancing patient care, provider education, and data delivery.^[4] However, mobile phones are a powerful and unexplored modality for documentation improvement in neurosurgery, a department with great potential due to high acuity and busy censuses.^[7] To the best of our knowledge, this study represents the first initiative to utilize the proven powers of mobile phone supported applications in the novel scenario of improving neurosurgical quality metrics. We show that there is an opportunity in documentation improvement through retrospective reviews of patient charts. This tool was developed to target the most missed variable categories discovered in three neurosurgical populations in our department. Overall, the previous studies show that the most commonly missed factor in documentation are nutritional variables.^[15] This correlates to our results such that the most commonly missed variables were within nutritional categories across all three patient groups, indicating that interventions are essential to capture these variables. In practice, we suggest that this tool be used as a quick checklist, which, in theory, would take only a couple of minutes. For example, the brain tumor category contains only 21 variables, requiring less than 1 swipe on a smartphone to scroll through the entire list. If a patient is treated for a brain tumor, the documenting provider could reference the application after writing the note to detect the lesser obvious, but impactful variables like “chronic fatigue conditions.” The provider would then expand this description to understand exactly what needs to be documented for the coding process. Therefore, this would allow targeting of the three large barriers of accurate capturing of quality metrics: documentation, coding, and education.

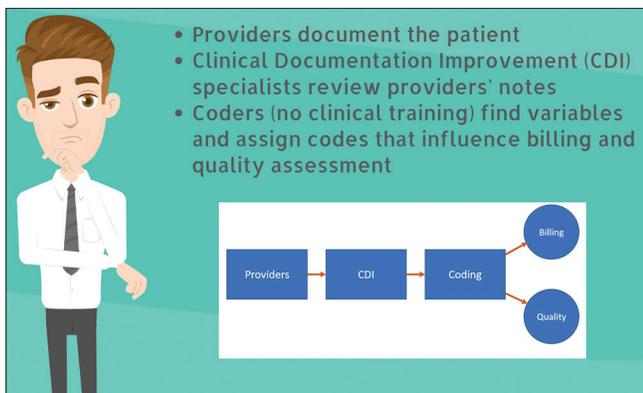
Documentation issues

Correct documentation of comorbid conditions (CCs) and major CCs (MCCs) is essential for accurate coding, reimbursement, epidemiological data, and provider/hospital quality metrics.^[9] If two like patients undergo the same procedure, each will be coded equally, with an equal expected LOS. However, if one patient has significant CCs or MCCs that are documented clearly, his or her expected LOS increases along with an increase in potential reimbursement, and improvement in quality metrics. The specific CCs and MCCs that are coded for each MS-DRG vary.

Coding issues

Multiple barriers exist between providers and coders including the value placed on documentation as well as

the language used between parties.^[8] Providers may not see the value in accurate and detailed documentation as they may not be familiar with the coding process. They may be unaware of the downstream effect; their documentation has on reimbursement as well as their own and their hospital's quality rankings. Furthermore, differences in language utilized by providers versus coders create a discrepancy and gap in translation. This may be the biggest factor in missed variables as coders may not know the medical jargon used by providers. Coders may have difficulty interpreting documentation, omitting possible CCs and MCCs. Clarifying diagnoses through queries are a cumbersome process and by improving the upstream documentation, coders will be able to code more efficiently and accurately.



Video 1: Educational animated video providing an overview of the role of clinical documentation improvement, coding, Vizient, and a demonstration of the proposed mobile application.

Educational issues

The previous studies report on attempts to improve provider education surrounding coding and clinical documentation through use of an educational handout and group discussion,^[10] as well as distributing laminated cards of the most commonly missed variables.^[11] Unfortunately, lectures and group discussions are time intensive and may not facilitate sufficient engagement between providers. While laminated cards are less time intensive, they lack the message of importance of accurate documentation. A brief, yet, impactful way to educate providers about documentation and the coding process is needed to maximize improvements in quality metrics. Thus, we developed a 2 min educational video followed by use of a mobile application as the most advanced and effective way to educate health-care providers. Both of these methods solve the issues of large time commitment and lack of engagement. The mobile application is easy and quick to use while the short educational video provides the importance and reasoning behind using the application.

Limitations

This study is limited to the data within the neurosurgical department in one academic center. This application was developed based on retrospective data that show opportunity for improvement exists. However, the next steps require real-world implementation and prospective data on the true impact of such interventions. Generalizability may be limited due to several differences such as hospital structure, types of procedures commonly performed, and individual provider

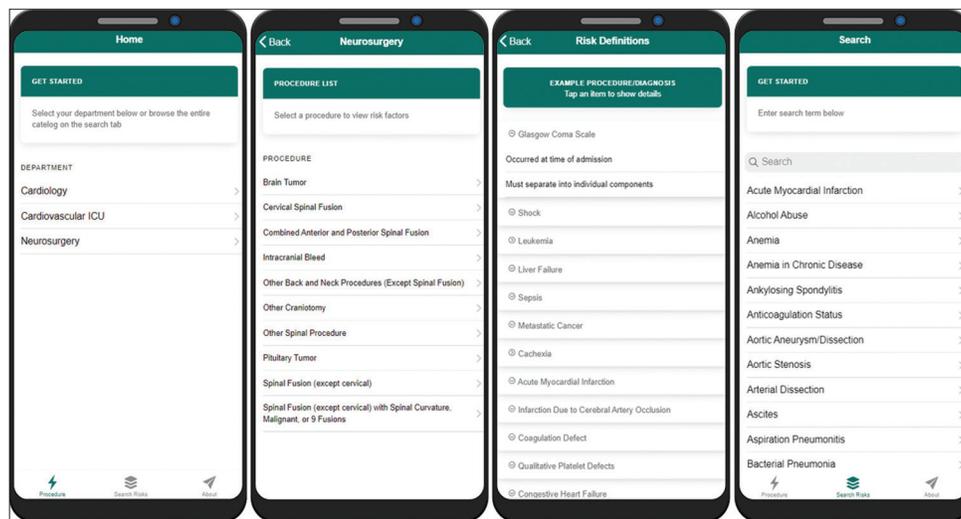


Figure 1: Mobile application to facilitate clinical documentation. Data in this figure are an example and do not represent an exact Vizient risk model. (a) Home page where department can be selected, (b) department page where relevant procedure can be selected, and (c) procedure page showing applicable variables to document. Certain variables can be expanded for further explanation, (d) search page allows user to search for any variable in the application. Clicking the variable opens a descriptive page providing variable explanations.

familiarity with the coding process. This further reinforces the need for department-specific interventions; however, the use of technology has a proven positive record in health care. While we provide a preliminary proof-of-concept and inspiration, the future steps are limitless. The possibility for direct integration into the electronic medical record could increase efficiency and adoption. We are working toward implementing this mobile application seamlessly into the daily workflow for the neurosurgery department. Although, this system should not be unique to neurosurgery and can be expanded easily into other departments throughout hospitals once a framework is created.

CONCLUSION

This study identifies several opportunities for documentation accuracy improvement within a single academic neurosurgery department. To the best of our knowledge, this study represents the first initiative to specifically improve neurosurgical quality metrics by utilizing a mobile phone supported application, a modality proven to have profound impacts in health care. Accurate documentation, or lack thereof, influences quality metrics, accurate identification of areas requiring improvement for patient care, and reimbursement. Therefore, it is of vital importance to utilize technological advancements and provide individualized tools and education for the improvement of clinical documentation, especially within acute departments such as neurosurgery. While we retrospectively present that opportunity for improvement in several patient populations exists, the future studies are essential to prospectively determine the real-world impact, mobile phone supported tools can have on documentation improvement. It is our hope that this preliminary proof-of-concept study will inspire other initiatives in neurosurgery to improve quality metrics and patient care by utilizing similar strategies.

Disclosure

None of the authors have any financial or personal affiliations with Vizient. The database is used to track internal quality metrics and the manuscript was approved for publication by Vizient. There are no conflicts of interest to disclose.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Abdulla S, Simon N, Woodhams K, Hayman C, Oumar M, Howroyd LR, *et al.* Improving the quality of clinical coding and payments through student doctor-coder collaboration in a tertiary haematology department. *BMJ Open Qual* 2020;9:e000723.
2. Giguère A, Légaré F, Grimshaw J, Turcotte S, Fiander M, Grudniewicz A, *et al.* Printed educational materials: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev* 2012;10:CD004398.
3. Grudniewicz A, Kealy R, Rodseth RN, Hamid J, Rudoler D, Straus SE. What is the effectiveness of printed educational materials on primary care physician knowledge, behaviour, and patient outcomes: A systematic review and meta-analyses. *Implement Sci* 2015;10:164.
4. Hakes NA, Kethman WC, Spain D, Nassar AK. Mobile application-based guidelines to enhance patient care and provider education in trauma and acute care surgery. *Trauma Surg Acute Care Open* 2020;5:479.
5. Hammers R, Anzalone S, Sinacore J, Origitano TC. Neurosurgical mortality rates: What variables affect mortality within a single institution and within a national database? *J Neurosurg* 2010;112:257-64.
6. Hay P, Wilton K, Barker J, Mortley J, Cumerlato M. The importance of clinical documentation improvement for Australian hospitals. *Health Inf Manag* 2020;49:69-73.
7. Horwood CR, Latimer T, Powers CJ, Moffatt-Bruce SD, Rushing GD, Eiferman DS. Improving the mortality index by capturing patient acuity through interprofessional real-time documentation improvement in a single hospital system. *Surgery* 2018;164:687-93.
8. Kessler BA, Catalino MP, Jordan JD. Reducing the reported mortality index within a neurocritical care unit through documentation and coding accuracy. *World Neurosurg* 2020;133:e819-27.
9. Kittinger BJ, Matejicka A, Mahabir RC. Surgical precision in clinical documentation connects patient safety, quality of care, and reimbursement. *Perspect Health Inf Manag* 2016;13:1f.
10. Liu W, Walsh T. The impact of implementation of a clinically integrated problem-based neonatal electronic health record on documentation metrics, provider satisfaction, and hospital reimbursement: A quality improvement project. *JMIR Med Inform* 2018;6:e40.
11. Rosenbaum BP, Lorenz RR, Luther RB, Knowles-Ward L, Kelly DL, Weil RJ. Improving and measuring inpatient documentation of medical care within the MS-DRG system: Education, monitoring, and normalized case mix index. *Perspect Health Inf Manag* 2014;11:1c.
12. Shepherd J. What do we really want from clinical documentation improvement programs? *Health Inf Manag* 2018;47:3-5.
13. Swaminath D, Hefner JL, Jenkins LA, Suarez JA, Meyerrose G, Huerta TR. Improving clinical documentation in an academic

- setting: A multidisciplinary team approach focused on the physician's perspective. *J Healthc Manag* 2018;63:E88-98.
14. Tarantino I, Widmann B, Warschkow R, Weitzendorfer M, Bock S, Roeske S, *et al.* Impact of precoding on reimbursement in diagnosis-related group systems: Randomized controlled trial. *Int J Surg* 2021;96:106173.
 15. Tobert CM, Mott SL, Nepple KG. Malnutrition diagnosis during adult inpatient hospitalizations: Analysis of a multi-institutional collaborative database of academic medical centers. *J Acad Nutr Diet* 2018;118:125-31.
 16. Zalatimo O, Ranasinghe M, Harbaugh RE, Iantosca M. Impact of improved documentation on an academic neurosurgical practice. *J Neurosurg* 2014;120:756-63.

How to cite this article: Porwal MH, Feller CN, Kumar D, Kolinski J, Sinson GP. MedCDI: A technology-based documentation and quality improvement initiative in neurosurgery. *Surg Neurol Int* 2022;13:271.