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BRIEF REPORT

Rethinking Measures and Mortality Attribution in Health Care: The Diabetes and Endocrinology Example

Lorenzo Olivero, MD; Jorge Sinclair, MD; Trisha Singh, MD; Aditya A. Khanijo, MBBS; Gunjan Mundhra, MBBS; Ana-Maria Chindris, MD; Terri Menser, PhD; Pablo Moreno Franco, MD; Benjamin D. Pollock, PhD; and Razvan M. Chirila, MD

Abstract

This study investigated the accuracy of mortality attributions assigned by the US News and World Report (USNWR) to the diabetes and endocrinology specialty. We reviewed medical records of all consecutive Medicare fee-for-service inpatients at Mayo Clinic, Florida (Jacksonville, Florida) with a Medicare Severity Diagnosis Related Group included in the USNWR Diabetes & Endocrinology specialty cohort admitted from November 2018 to April 2022, with documented mortality in our institution's electronic health record within 30 days of the index admission. A clinician adjudicated the primary cause of death, categorizing it as diabetes or endocrine, cancer, failure to thrive, or other. Among 49 deceased patients, only 7 (14.3%) had diabetes or an endocrine-related cause of death. Cancer (49.0%) and failure to thrive (30.6%) were the leading causes. This substantial discrepancy (86% misattribution) suggests USNWR's methodology might not precisely reflect the quality of care, potentially misleading patients and impacting hospital rankings.

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The US hospital quality rankings and ratings can inform patients where to find dependable, high-quality care while also motivating hospitals to provide high-quality, patient-centered care.[1,2] In particular, the US News and World Report's (USNWR) best hospitals rankings have grown in popularity since their inception more than 30 years ago.[3] However, several important limitations to these rankings have been noted in the literature, such as the exclusion of commercially insured patients and outpatient encounters from outcomes measurement despite making up the overwhelming majority of procedural cases,[4,5] and a risk-adjusted 30-day survival methodology and score that favors large volume hospitals.[6] The latter point is crucial in USNWR specialties such as diabetes and endocrinology, which include only inpatient and Medicare encounters. By excluding the overwhelming majority of diabetes and endocrinology patients who are seen in an outpatient setting, the USNWR ranking artificially creates a low volume and low event size environment in which even 3 or 4 misclassified patient mortalities in a given year can mean the difference between a top-20 or top-50 ranking. Therefore, it is important to critically assess whether patients' clinical statuses and disease states align with USNWR-assigned specialties to ensure validity and reliability of these rankings. In this analysis, we used clinician chart review and adjudication to determine to what extent the 30-day mortalities attributed to the USNWR diabetes and endocrinology specialty are actually attributable to diabetes or endocrine conditions.

METHODS

Our study population consisted of all patients included in the USNWR Diabetes & Endocrinology specialty cohort,[3] namely Medicare fee-for-service inpatients at Mayo Clinic, Florida (Jacksonville, Florida) with a Medicare Severity Diagnosis Related Group (MS-DRG) admitted from November 2018, through April

From the Department of Critical Care, Mayo Clinic, Jacksonville, FL (L.O., J.S., T.S., A.A.K., G.M., P.M.F.); Department of Internal Medicine, Jacobi Medical Center, New York, NY (L.O.); Department of Internal Medicine, Mount Sinai Morningside and Mount Sinai West, Icahn School of Medicine at Mount Sinai, New York, NY (J.S.); Department of Internal Medicine, Texas Tech University Health Sciences Center, Odessa, TX (T.S.); Department of Internal Medicine, HCA Florida Orange Park Hospital, Jacksonville, FL (G.M.); and Department of Endocrinology, Diabetes and Metabolism (A.-M.C.), Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery (T.M., P.M.F., B.D.P.), and Department of Internal Medicine (P.M.F., R.M.C.), Mayo Clinic, Jacksonville, FL.

TABLE. Patient Characteristic[a]

Characteristic	N=49
Age (y), median (IQR)	74 (69-84)
Sex, n (%)	
Male	23 (43.9%)
Female	26 (56.1%)
Serum sodium (mEq/L), median (IQR)	132 (126-136)
Serum potassium (mEq/L), median (IQR)	4.4 (3.9-4.7)
Serum creatinine (mg/dL), median (IQR)	1.0 (0.7-1.4)
Hematocrit %, median (IQR)	34 (29-39)
White blood cell count (total/mm^3 in thousands), median (IQR)	10.2 (7.7-15.9)
Platelets, median (IQR)	208 (144-282)
Heart rate (beats per min), median (IQR)	90 (74-99)
Respiratory rate (breaths per min), median (IQR)	18 (16-20)
Mean arterial pressure (mm/Hg), median (IQR)	87 (78-95)
Vasopressor/inotrope, n (%)	6 (12.2%)
APACHE II score, median (IQR)	16 (14-24)
Palliative care consult, n (%)	
Diagnosis count, median(IQR)	26 (19-30)
Medicare Severity Diagnosis Related Group (MS-DRG, n [%])	
614. Adrenal and pituitary procedures with CC/MCC	1 (2.0%)
620. OR procedures for obesity with CC	1 (2.0%)
626. Thyroid, parathyroid, and thyroglossal procedures with CC	1 (2.0%)
637. Diabetes with MCC	3 (6.1%)
638. Diabetes with CC	1 (2.0%)
640. Miscellaneous disorders of nutrition, metabolism, fluids and electrolytes with MCC	34 (69.4%)

Continued on next column

2022 with documented mortality in our institution's electronic health record within 30 days of the index admission. This study was approved by Mayo Clinic IRB #22-010086, and patient consent was not obtained. Because of the nature of the study, all patient data was analyzed and reported in a deidentified form. For each death, we abstracted key patient characteristics and clinical statuses, including principal and secondary international classification of diseases, 10th revision codes. A clinician reviewed each mortality and adjudicated the primary diagnosis leading to the patient's decline and death, which was then categorized after brief initial qualitative review into the following: (a) diabetes or endocrine; (b) cancer; (c) failure to thrive; or (d) other.

Patients identified with cancer were categorized based on the severity and impact of the disease. Specifically, cancer referred to cases of metastatic end-stage cancer where the outcome was directly linked to this condition. Other patients with cancer, where it was not the primary cause of the outcome, were not included in this category. This distinction was made to differentiate between those whose primary cause of death was cancer and those with other terminal conditions.

The failure to thrive category encompassed end-stage conditions that ultimately caused the failure to thrive, decline, and death, such as dementia, encephalopathy, end-stage respiratory failure, end-stage liver failure, end-stage kidney failure, sequelae of severe stroke, and recurrent aspiration.

RESULTS

We identified N=49 patients who met inclusion criteria and experienced 30-day mortality. The mean ± SD age was 76.3±9.0, 26 (53.1%) were female, and 23 (43.9%) were male. Of which, 7 (14.3%) were admitted to the intensive care unit and the mean ± SD count of international classification of diseases, 10th revision diagnosis codes was 25.0±7.9. Only 7 patients (14.3%) had a cause of death attributable to a diabetes-related or endocrinology-related condition. Cancer and failure to thrive were the main causes of death in our review (49.0% and 30.6%, respectively), with 34/49 deaths (69.4%) coming from MS-DRG 640: miscellaneous disorders

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TABLE. Continued

Characteristic	N=49
Medicare Severity Diagnosis Related Group (MS-DRG, n [%]), continued	
643. Endocrine disorders with MCC	5 (10.2%)
644. Endocrine disorders with CC	3 (6.1%)
Primary diagnosis, n (%)	
Endocrine	
Obesity	1 (2.0%)
Pituitary tumor	1 (2.0%)
Thyroid tumor	1 (2.0%)
Diabetes	
Hypoglycemia	3 (6.1%)
Ketoacidosis	1 (2.0%)
Not an endocrine-related or diabetes-related primary diagnosis	42 (85.7%)
Adjudicated clinical category for patient decline and death, n (%)	
Diabetes or endocrine[b]	7 (14.3%)
Cancer	24 (49.0%)
Failure to thrive[c]	15 (30.6%)
Other (end-stage liver or respiratory failure)	3 (6.1%)

[a]Abbreviations: APACHE, acute physiology and chronic health evaluation score; CC, complications or comorbidities; IQR, interquartile range; MCC, major complications or comorbidities; OR, operating room.

[b]The 7 cases with endocrine or diabetes mortalities were: 4 mortalities in MS-DRGs 637-638 diabetes with MCC/CC; 1 mortality in MS-DRG 626 thyroid, parathyroid and thyroglossal procedures with CC; 1 mortality in MS-DRG 620 OR procedures for obesity with CC; and 1 mortality in MS-DRG 614 adrenal and pituitary procedures with CC/MCC.

[c]Include dementia, encephalopathy, end-stage respiratory failure, end-stage liver failure, end-stage kidney failure, sequelae of severe stroke, and recurrent aspiration.

of nutrition, metabolism, fluids, and electrolytes with major complications or comorbidities, the most common endocrinology MS-DRG in the USNWR rankings. Additional characteristics are shown in Table.

DISCUSSION

Among the 49 adjudicated mortalities in patients eligible for the USNWR diabetes and endocrinology specialty at our hospital, we found that only 14% were related to a primary endocrine or diabetes diagnosis, whereas 86% of these mortalities resulted from multiple primary end-stage comorbidities, such as cancer or failure to thrive, particularly among patients in MS-DRG 640, to which diabetes and endocrinology sequelae were secondary results.

Patients assigned to the MS-DRG 640 for electrolyte abnormalities, severe malnutrition, dehydration, and failure to thrive, typically suffered from multiple end-stage conditions leading to their decline and death. Similarly, syndrome of inappropriate secretion of antidiuretic hormone and hyponatremia, which could be considered endocrine, were often linked to cancer or other end-stage comorbidities, indicating a poor prognosis.[7] These findings reveal that although certain electrolyte abnormalities may be categorized as endocrine issues, they frequently do not reflect primary endocrine dysfunction but rather secondary dysregulation caused by severe or end-stage illnesses.

A similar discrepancy between the specialty assigned by USNWR and the actual specialty care received has been identified by Shah et al.[8] They found that only a minority of claimed deaths were potentially associated with otolaryngology and urology care, with 5 out of 14 cases (36%) and 2 out of 19 cases (11%), respectively. Similarly, Freeman et al[9] reported a 32% correct attribution rate between the external DRG-based method and chart review of their mortality claim data in otolaryngology services.

The discrepancies are likely due to the methodology employed by USNWR, which in addition to including only inpatient Medicare encounters, uses an independently developed mapping schema to assign MS-DRGs to each specialty based on insurance claims. Consequently, a death attributed to a particular specialty through an MS-DRG is counted as a death for that specialty, irrespective of whether that specialty was involved in the patient's care or whether the specialty-related condition was the main cause of death.[1]

Most patients had multiple end-stage conditions, and the adjudication process focused on the immediate causes of failure to thrive, decline, and death. These deaths often presented with hypercalcemia and hyponatremia, which could conceivably be linked to endocrine issues. However, they are more realistically indicative of dysregulation due to

cancer or other terminal comorbidities rather than primary endocrine dysfunction.[10]

Electrolyte disturbances or conditions such as diabetes, which are prevalent comorbidities among inpatients, should be more accurately considered when evaluating mortality data and developing ranking systems, especially those utilizing billing codes like the DRG-based methodology employed by USNWR. These conditions are common in our patient population and might be assigned specific billing codes. However, our review indicates that only a few of these claims were truly due to endocrine-related conditions, underscoring an important issue in the accurate attribution of cause of death. Effectively, MS-DRG 640 is an appropriate attribution in terms of coding and documentation. However, we suggest that patients with an MS-DRG 640 should not be included in the USNWR diabetes and endocrinology specialty ranking because these patients nearly always had non-endocrine chronic diseases underlying the electrolyte or metabolic issues in our study population.

This strongly supports the notion that USNWR's methodology for attributing mortality may not be entirely accurate considering the additional methodological limitations, such as exclusion of outpatient encounters and commercially insured patients. Consequently, this could mislead the rankings' target audience, leading to not only reimbursement errors for health care facilities and providers but also mistaken decisions by patients when choosing the quality of care for their conditions.

CONCLUSION

Our analysis highlights significant discrepancies between USNWR mortality attribution for diabetes and endocrinology specialty and the adjudicated causes of death based on clinician review. We found that only 14.3% of mortalities were directly attributable to diabetes or endocrine conditions, whereas the remaining 85.7% resulted from other comorbidities like cancer and failure to thrive. These findings align with previous studies reporting similar shortcomings in USNWR's methodology across different specialties.

These, and other methodological discrepancies can potentially mislead patients seeking high-quality care and create inaccurate perceptions of hospital performance. Our findings emphasize the need for a more nuanced approach to mortality attribution in hospital ranking systems, potentially incorporating clinical data beyond administrative billing codes.

POTENTIAL COMPETING INTERESTS

The authors report no competing interests.

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Abbreviations and Acronyms: **MS-DRG,** Medicare severity diagnosis related group; **USNWR,** US News and World Report

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Correspondence: Address to Razvan M. Chirila, MD, Department of Internal Medicine, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224 (chirila.razvan@mayo.edu).

ORCID

Lorenzo Olivero: https://orcid.org/0000-0003-2358-9527; Razvan M. Chirila: https://orcid.org/0000-0002-1914-5985

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