Linda Brown, MBus, BBus (Mgmt)
Improving Palliative
Aged and Chronic Care through Clinical
Research and Translation (IMPACCT) and
Palliative Care Clinical Studies Collaborative
(PaCCSC)
University of Technology Sydney
NSW, Australia

Janet Hardy, BSc, FRACP, FAChPM, MD
Department of Palliative and Supportive Care
Mater Health Services and Mater Research
Institute
University of Queensland
Brisbane, QLD, Australia

Jennifer Weil, BMed
Department of Palliative Medicine
St Vincent's Hospital
Melbourne, Victoria, Australia

David Christopher Currow, BMed, MPH, PhD,
FRACP, FAHMS
Improving Palliative
Aged and Chronic Care through Clinical
Research and Translation (IMPACCT) and
Palliative Care Clinical Studies Collaborative
(PaCCSC)
University of Technology Sydney
NSW, Australia
E-mail: david.currow@uts.edu.au

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Candidate Claims-Based Indicators of Functional Impairment: An Exploration in a Sample of Medicare Beneficiaries

Introduction

Recent healthcare reforms aim to improve the quality and reduce the costs of care for seriously ill adults.[1] Palliative care and other programs focused on care for seriously ill adults typically rely on provider referrals to identify patients, an approach which may lack sensitivity (i.e., may miss those who could benefit) and specificity (i.e., may refer patients with low needs). Systematic case-finding using data from the electronic health record and administrative claims could improve on provider referral in terms of finding all (and only) those with palliative care needs. Such a targeted approach would help to maximize the potentially beneficial impact of a high resource clinical intervention and facilitate value-based care.

In 2018, an expert advisory committee to the Department of Health and Human Services recommended the agency test two alternative payment models for the delivery of community palliative care. In both models, functional impairment is an eligibility criterion for the receipt of palliative care.[2,3] However, functional status is not captured consistently across providers or settings limiting its application within systematic case-finding approaches. We therefore sought to test whether a claim for selected

medical equipment items or home oxygen (claims-based indicators) could serve as a surrogate for self-reported functional impairment. Although other studies have drawn on diagnostic and demographic data to model the probability of functional impairment,[4] we sought instead to identify a simple proxy for functional impairment to be used independently of, or as an addition to, diagnosis, for case-finding purposes. In doing so, we mirror the approach within the proposed payment models, in which a durable medical equipment order is used as a proxy for functional impairment.[2]

Methods

Study Sample

We undertook a cross-sectional analysis of a sample of subjects from the first wave (2011) of the National Health and Aging Trends Study (NHATS). NHATS surveys a nationally-representative cohort of Medicare beneficiaries aged 65 years and older through annual in-person interviews.[5] We restricted the sample to self-respondents resident in the community ($n = 7609$). NHATS was linked to Medicare files on a subject level to enable identification of claims. Because of missing claims data within Medicare Advantage, we included only patients with 12 months continuous Medicare fee-for-service enrollment before interview ($n = 4781$).

Outcome Measure

Self-reported functional impairment was defined as need for assistance in *any* of six activities of daily living (ADLs: mobility indoors, transfers, dressing, bathing, toileting, and eating).[6] We also undertook a sensitivity analysis using a more restrictive definition of functional impairment (need for assistance in three or more ADLs).

Predictor of Interest

Our predictor of interest was the presence of a Medicare claim, during the 12 months before interview, for a selected medical equipment item or home oxygen. We developed the list of claims-based indicators using a focused literature review and the authors' collective clinical experience. Claims were identified from patients' Medicare Carrier and Durable Medical Equipment files. The final list included claims for: 1) medical assistive devices, such as cane; walker; commode, urinal, bedpan; shower-, tub-, toilet-assistive device; lift, transfer board, safety belt/harness/vest; hospital bed; wheelchair and 2) outpatient oxygen (codes are available in from the author). Additional variables were obtained from NHATS (age, sex, race/ethnicity, marital status, education, insurance, self-reported health, and self-report of device use).

Statistical Analysis

Descriptive statistics were used to report the characteristics of the overall sample, t-tests or chi-squared tests to compare characteristics by functional status. We determined the sensitivity, specificity, and c statistic (sensitivity/specificity) of claims-based indicators for identification of patients with functional impairment.

Institutional Review Board Review

Johns Hopkins University institutional review board approved the NHATS protocol, all participants provided written informed consent. The Icahn School of Medicine at Mount Sinai institutional review board and the Centers for Medicare & Medicaid Services Privacy Board approved the study.

Results

The sample included 4781 patients. The mean age was 76 years, 56% female, and 84% white and non-Hispanic. Sixteen percent had functional limitation, 10% were impaired in two or more ADLs, and 6% in three or more ADLs. Patients with functional impairment were older, more likely to be female, more likely to be non-White or Hispanic, more likely to have Medicaid, and to report fair or poor health.

Table 1 reports sensitivity, specificity, and c statistic of the claims-based indicators for identifying functional impairment. Overall, the most common claims-based indicator was the wheelchair (prevalence: 2.4%) and the least common claims-based indicator was the walker. Presence of a claim for *any* medical assistive device identified 21% of the population with functional impairment. In terms of individual devices, a claim for a wheelchair, or hospital bed, had the greatest sensitivity. Presence of a claim for oxygen identified 11%, and medical assistive device *or* oxygen 29%, of those with functional impairment. Any claim for hospital bed *or* oxygen *or* wheelchair, proposed surrogate indicators of functional impairment,[2,3] identified 25% of those with functional impairment. Claims-based indicators had high specificity (0.97−1.00). The combination of *any* medical assistive device *or* oxygen had the best overall predictive utility, with a c statistic of 0.62. Using the more restrictive definition of functional impairment (assistance in three or more ADLs), presence of a claim for medical assistive device *or* oxygen (the most sensitive approach) identified 38.3% and retained a specificity of 0.94 (data not shown).

Discussion

In this nationally-representative sample of Medicare beneficiaries, our claims-based indicators had limited sensitivity, identifying just under one-third of those with self-reported functional impairment. The

Table 1
Sensitivity, Specificity, and c Statistic of Claims-Based Indicators for Identification of People With Functional Limitation ($n = 4781$)

	Sensitivity	Specificity	c Statistic
Medical assistive devices			
Any	0.21	0.97	0.59
Cane	<0.05	0.99	0.50
Walker	<0.05	1.00	0.50
Commode or urinal or bed pan	<0.05	0.99	0.52
Shower-, tub-, or toilet-assistive device	<0.05	1.00	0.50
Lift, transfer board, safety belt/harness/vest	<0.05	1.00	0.51
Hospital bed	0.09	1.00	0.55
Wheelchair	0.09	0.99	0.54
Oxygen	0.11	0.97	0.54
Claims-based indicators in combination			
Medical assistive device or oxygen	0.29	0.94	0.62
Hospital bed or wheelchair or oxygen	0.25	0.96	0.61

combination of hospital bed *or* oxygen *or* wheelchair, proposed as a claims-based surrogate for functional impairment in a recent payment model for palliative care, identified just 25% of people with functional impairment. Overall, however, claims-based indicators had high specificity.

Health systems, payers, and providers are increasingly seeking to use case-finding algorithms to identify people with serious illness. Functional impairment is a key component of serious illness but is not consistently captured across settings and providers.[7,8] Our claims-based indicators are highly specific indicators of functional impairment, desirable for programs seeking to achieve cost neutrality by identifying people with serious illness without the requirement for further screening. On the other hand, reliance on poorly sensitive claims-based indicators as surrogates of functional impairment underestimates the true size of the population with serious illness with a number of implications. Firstly, it provides an artificially low estimate of the amount of care at the population level and fails to identify many seriously ill people who may have significant unmet care needs. Secondly, it may lead to biased quality of care assessments, in that the denominator excludes people with serious illness not identified by the algorithm, the same people who necessarily fall outside of the realm of targeted interventions.[9] Thirdly, it may result in underpayment to providers because of inadequate risk adjustment which in turn may impact access to high quality palliative care.[10] Although the claims-based indicators performed better in identifying those with more severe functional impairment, sensitivity was still limited. It is possible that incorporation of other claims data, for example, receipt of home health care, may improve the utility of our approach. Nonetheless, we suggest that those pursuing a population health approach to care for people with serious illness give consideration to the routine collection of data on functional status in all clinical settings.

The poor sensitivity of claims-based indicators does not reflect lack of use of devices, but rather use that is not captured in claims. Indeed, 90% of subjects with functional impairment also reported using an assistive device. One explanation may be that by examining claims during 12 months before the NHATS index interview, we missed claims for assistive equipment occurring more than 12 months before interview. Another possibility, however, is that subjects acquired equipment outside of Medicare.

There are limitations to consider. Our sample was restricted to Medicare fee-for-service beneficiaries. Whether individuals with functional impairment within Medicare Advantage plans are more or less likely to obtain equipment through their plans is not known. Furthermore, although we designed the list of codes to be comprehensive, it is possible that it omitted some medical assistive devices. Finally, as discussed previously, we retained a focus on medical assistive devices; other information, for example, receipt of home health care, may improve utility of this approach.

Conclusion

We demonstrated that claims for medical assistive devices and oxygen are specific, yet poorly sensitive indicators of functional impairment. Health systems, payers, and providers should consider routinely collecting data on functional status in all clinical settings. Doing so will facilitate accurate identification of the population with serious illness, to assure efficient care delivery, accurate quality measurement, and risk-adjustment, all integral components of high value care.

Harriet L. Mather, BMBCh, MSc
Evan Bollens-Lund, MA
Mohammed Husain, MA
Amy S. Kelley, MD, MSHS
Brookdale Department of Geriatrics and Palliative Medicine
Icahn School of Medicine at Mount Sinai
New York, USA
E-mail: harriet.mather@mssm.edu

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Case Series of Left Stellate Ganglion Blocks for Refractory Angina Pectoris: 14 Years Later and Still Efficacious

To the Editor:

Refractory angina pectoris (RAP) is conventionally defined as a chronic pain condition characterized by chest pain (angina) resulting from diffuse coronary artery disease which cannot be treated by a combination of optimal medical therapy or revascularization.[1] In Europe, the annual incidence of RAP is estimated at 30,000–50,000 new cases per year.[2] Revascularization (surgery or percutaneous intervention) is not option for these patients because of unfavorable coronary anatomy, unsuccessful previous coronary artery bypass graft (CABG) or percutaneous coronary intervention, lack of suitable grafting conduit material, significant comorbidities, advanced age, etc. RAP can also include patients with microvascular angina. Traditional options for this patient group are limited to anti-anginal drug therapy and secondary risk factor modification. Long-term mortality in this patient group was thought to be very high, but recent data contradict this. Recent case series of spinal cord stimulation (SCS) for RAP showed 50% survival after implantation of five years[3] and the mortality rate among all patients with RAP has been found out to be <4% annually; 70% survive for nine years or more. It thus becomes important to focus on symptom control and ways to achieve an improved quality of life in this growing population.[4]

Among the reported therapies for pain due to RAP are neuromodulation by transcutaneous electrical nerve stimulation or patient-controlled SCS and coronary sinus reducers to optimize endo-epicardial blood flow ratio.[5] In 2005, Moore et al. published in this journal a trial of temporary left cervical sympathectomy for pain control in RAP.[5] They compared this with paravertebral blockade and concluded that cervical sympathectomy is a safe and easy analgesic option. The first publication on sympathectomy to relieve chest pain was in 1933 and the potential for long-standing benefits from intermittent blockade was described in 2000.[6,7] We describe the use of cervical sympathectomy via repeated left stellate ganglion block (LSGB) for management of RAP.

Case Series

A total of 120 LSGBs were performed in our institution between 2011 and May 2019. A summary of the 12 treated patients can be found in Table 1. Six patients experienced significant pain relief. A summary of before-and-after pain score can be found in Table 2.

Patient 1

This patient first underwent CABG in 1997 followed by further coronary stenting for the grafts in 2007, but the interventions did not provide much symptomatic relief. He then underwent a trial of SCS in 2007, which was also unsuccessful. Despite opioid therapy, he remained house bound and used a mobility scooter. His first trial of LSGB was in 2007. He underwent blocks every three months for two years. Each block