



Review Article

Significant Cost Savings Can Result from Accurate Coding of Carotid Duplex Indications and Elimination of Inappropriate Tests

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Abstract

Introduction

Reimbursement for Carotid Duplex Ultrasound (CDU) is often tied to indications documented by International Classification of Diseases (ICD) codes.

Methods

We reviewed the clinical scenario of the initial ICD codes on 550 outpatient CDUs and re-classified them according to appropriateness guidelines and estimated cost savings if all Inappropriate (I) and some Uncertain (U) CDU were eliminated.

The initial ICD codes were inaccurate in 17.4% and re-classified. In the United States, Medicare incurred charges of \$568M and paid \$82M for all out-patient CDU in 2011.

Discussion

Extrapolating from our data, elimination of all I and half of U CDU studies in Medicare patients would result in annual taxpayer savings of \$17.5M. A sizeable number of ICD codes provided as indications for outpatient CDU testing are inaccurate based upon a clinician review. Vascular specialists using similar analytics will have to be at the forefront of limiting demand for I or U indications for non-invasive vascular testing.

Keywords: Carotid duplex scan; Cost savings; Diagnostic testing; Medicare savings

Uwe Reinhardt, a Princeton healthcare economist, has estimated that 20-30% of the 3 trillion dollars in healthcare spending may be without value and can be eliminated without compromising patient care [1]. The Institute of Medicine recently estimated that \$210 billion annually is wasted on unnecessary diagnostic tests, procedures

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Citation: Satiani B, Masterson L, Kudlaty E, Starr JE, Go MR (2016) Significant Cost Savings Can Result from Accurate Coding of Carotid Duplex Indications and Elimination of Inappropriate Tests. J Angiol Vasc Surg 1: 002.

Received: October 29, 2015; **Accepted:** March 25, 2016; **Published:** April 08, 2016

and treatment [2]. Until very recently the volume of imaging studies had been growing at a 6% annual rate for Medicare beneficiaries in the United States [3]. The possible reasons for physicians overutilizing imaging studies is evident in a Rand Corporation study, which showed that 85% of emergency department physicians perceived that unnecessary imaging studies were done mainly for fear of missing low probability diagnoses and fear of litigation [4]. In response to payer and media pressure, there is a national grass roots movement by all healthcare professionals which, seeks to protest healthcare overutilization and misuse [5].

Reimbursement by Medicare for Carotid Duplex Ultrasound (CDU) is tied to indications as documented by International Classification of Diseases (ICD) codes. Indications for CDU have been classified as Appropriate (A), Uncertain (U), or Inappropriate (I) by multi-specialty guidelines [6]. We hypothesized that a significant proportion of ICD codes offered as indications for CDU testing in the medical record were being performed for U or I indications. Therefore, we sought to validate the initial ICD codes for CDU by a clinician review of the medical record, re-classify the revised ICD codes according to appropriateness, and estimate the cost savings for Medicare if CDU for I and some U indications were eliminated.

Methods

We reviewed all out-patient Medicare CDU done in 2011 in our Inter Societal Accreditation Commission accredited Vascular Laboratory. All ICD codes from each patient in the study group were recorded. One of the authors (EK) then reviewed each electronic medical record and determined if the ICD code designated as the indication for CDU accurately reflected the clinical scenario. We utilized the multi-specialty guidelines recently published, which indicate indications as appropriate, uncertain or inappropriate to sort the ICD codes [7]. The rate of abnormal CDU in each of these groups was also analyzed. Initial ICD codes and revised ICD codes for CDU were then categorized as A, U, or I.

The National Medicare database was then queried for the number of CDU performed in the out-patient setting throughout the United States for calendar year 2011. CDU was identified by the Healthcare Common Procedure Coding System (HCPCS) Codes 93880 and 93882. The Medicare claim units, charges, cost and payment to providers were analyzed. Cost savings (payments) per year were then determined nationally for Medicare patients by postulating elimination of all I and a percentage of U CDU indications.

Chi square testing was used to compare the rates of abnormal CDU among individual ICD codes and groups. Fisher exact testing was used on contingency tables with small cell values. The conduct of this study was approved by The Ohio State University Institutional Review Board. It involved only the retrospective collection of existing data in a protected manner and was considered exempt by The Ohio State University.

Results

550 out-patient Medicare CDUs were performed in our Vascular Laboratory in calendar year 2011. 17.4% had their initial ICD code

re-classified based on our review. Significantly more I initial codes were changed, most often to the (U) category ($p < .001$) (Table 1). Revision of ICD codes resulted in 36 fewer CDU (7% of all CDU) initially classified as A. After final ICD codes were assigned, 3.27% of CDU studies were placed in the I category, 35.82% in the U category and 61% in the A category (Table 1).

	Original ICD Code	Final ICD Code assigned	Final ICD code Un-changed	ICD Code changed (%)
A (appropriate)	371 (68%)	335 (60.91%)	315 (61%)	56 (15%)
U (uncertain)	142 (26%)	197 (35.82%)	127 (36%)	15 (10.5%)
I (inappropriate)	37 (6%)	18 (3.27%)	12 (3%)	25 (67.5%)

Table 1: Appropriateness of carotid duplex scans before and after clinical review of medical records.

ICD - International Classification of Diseases

In terms of findings on CDU for the three categories, >50% stenosis was found significantly more often in the A category (20%) compared to the U (9%) or the I category (11%) ($P < .001$) (Table 2).

Study Results			
Final ICD code	# of CDU with < 50% stenosis	# abnormal CDU (>50% stenosis)	%
Appropriate	267	68	20%
Uncertain	180	17	9%
Inappropriate	16	2	11%

Table 2: Final International Classification of Diseases (ICD) Codes and Correlation with Carotid Duplex Scan Findings.

CDU - Carotid Duplex Ultrasound

The National Medicare database was subsequently queried for claims for HCPCS 93880 and 93881 in calendar year 2011. For HCPCS 93880, there were 545,355 claims and for 93882 there were 4,539 claims. The corresponding charge, cost, and payment are listed in table 3. Medicare incurred charges of \$568M and paid \$82M for all out-patient CDU in 2011 (Table 4). Extrapolating from our data, elimination of all I studies (3.27%) would result in annual savings of \$2.7M, and if half of U tests (half of 35.8%) were eliminated, combined savings of \$17.5M annually could accrue to the taxpayer (Table 4).

CDU studies	Claims	Charges \$	Payment \$
ICD 93880	545,355	565,108,309.9	82,304,710.29
ICD 93882	4,539	3,160,270.82	681,552.76
total	549,894	568,268,581	82,986,263
per unit		\$1033.21	\$150.88

Table 3: Claims, charges and payment by Medicare for Out-patient Carotid Duplex Ultrasound (CDU) studies (2011).

ICD - International Classification of Diseases

Indication	Medicare Charges\$ (2011)	Medicare Payment\$ (2011)		Medicare Cost Savings \$ 2011
Appropriate	346,127,226	50,546,178		
Uncertain	203,543,473	29,724,171	if 50% of U eliminated	14,862,085
Inappropriate	18,597,881	2,715,914	if 100% of I eliminated	2,715,914
		Total Potential Savings for 2011		\$17,577,999

Table 4: Medicare charges, payments and potential cost savings in year 2011.

Note: Cost savings are based upon payments, not charges.

Discussion

It is evident that the use of unnecessary or redundant diagnostic testing is important not only to economists, payers, healthcare executives, and patients but to physicians also. In a recent survey of members of the American College of Physician Leaders conducted by Navigant Consulting, 92% of respondents rated this issue as very high or high in importance [7]. When asked how much confidence they had in physicians managing the issue versus non-physician leaders, the members overwhelmingly indicated the issue was better managed by physicians (63% versus 14%). Eliminating or reducing unnecessary diagnostic testing is fundamentally a function of educating ordering physicians on appropriate guidelines.

Our study projects Medicare savings of \$2.7 million annually if all I out-patient CDUs can be eliminated. A fair number of ICD codes after clinician review were switched into the U category. Multi-specialty guidelines mention as U some indications for CDU such as screening examinations for intermediate or high risk Framingham score, syncope of uncertain causes, prior to open heart surgery and surveillance for asymptomatic carotid disease or post-intervention at inappropriate intervals [6]. We used these guidelines for classifying CDU into the A, U and I categories such as CDU prior to any open heart surgery, follow-up of <50% internal carotid artery stenosis, syncope and several other reasons as U indications for the test [6]. There is reasonable justification for estimating Medicare savings based upon elimination of CDU performed for U indications. Since there is not enough data available to judge appropriateness for some of the U indications, we performed a very basic sensitivity type analysis using varying percentages of U CDUs that could be eliminated to come up with dollar savings. For instance, if all I CDU and just 10% of U studies were to be eliminated, total savings for Medicare would be \$5.68M and if all I CDU test and 75% of U studies were to be eliminated, \$25M would be saved. This type of analysis is similar to forecasts that provide a best case or worst case scenario commonly used in budgetary projections. A reasonable middle of the road analysis would project \$14.8M in potential savings if half of the U studies and add to \$2.7M for all IN CDUs eliminated for a total savings of \$17.5M for Medicare (Table 4).

Medicare, the federally funded health insurance program for 55 million people ages 65 and over in the United States ages 65 and people with permanent disabilities accounted for 14% of the federal budget in 2014 and paid out approximately \$597 billion in 2014 [8]. Because of solvency concerns, Congress passed the Deficit Reduction Act of 2005 and cut Medicare spending on imaging by \$1.7 billion [9]. Health and Human Services also continues to focus on limiting overutilization of tests and procedures and curtailing fraud and abuse [10]. Since a significant number of Medicare patients have vascular disease and because imaging accounts for 23% of Vascular Surgery Medicare Part B revenues, appropriate utilization of vascular imaging is of paramount concern for vascular specialists [11]. Therefore, strategies to eliminate or curtail diagnostic testing of questionable value are becoming even more important given the trajectory of future value-based reimbursement systems by both Medicare/Medicaid and commercial payers.

Vascular specialists who interpret vascular laboratory studies are often aware of tests being requested for vague symptoms as indicated by both the patient's clinical history as well as ICD code. Erroneous coding may also result in a decrease in reimbursement to hospitals as shown by the number of I codes changed to U utilizing existing

guidelines based on our clinical review. The discrepancy between ICD coding and the patient's clinical condition has been described in other specialties [12,13]. Inaccurate coding by physicians or coders is the usual cause but office staff usually schedule out-patient CDU's based on physician notes in the medical record [14]. To expedite scheduling, the diagnosis may be assigned inappropriately or documentation may be lacking in the medical record in order to justify code assignment. In a study of acute ischemic strokes, 15-20% of primary ICD codes were noted to be erroneous [15].

A relevant example to illustrate unnecessary CDU testing is in patients with syncope. Scott et al., reported that 16.5% of all Medicare beneficiaries with syncope underwent a CDU and 6.5% of all CDU for Medicare patients in 2009 were performed for this indication [16]. In a chart review the authors found that although 15.4% of patients with simple syncope had a >50% stenosis by CDU, this finding was not associated with a causal diagnosis and <1 % proceeded to carotid endarterectomy. Kachalia and colleagues surveyed hospitalists in the United States to gauge practice patterns for the 2 common indications of preoperative evaluation and syncope [17]. Hospitalists reported overuse of some tests in 82-85% of syncope patient vignettes mostly to reassure themselves or the patient rather than for the test being clinically indicated.

Possible solutions

In the near future, third party appraisals of 'value' to the patient are very likely in most diagnostic and therapeutic scenarios with a focus on lowering healthcare costs. One metric that is likely to gain acceptance is use of practice guidelines and implementation of best practices. A variation may be to investigate if the cost of care (in this case measured by cost of diagnostic tests such as CDU) is appropriate in relation to evidence based guidelines. While guidelines have until now been reserved for therapeutic measures, the increased volume and associated cost of many diagnostic procedures will lead to similar scrutiny. If a single diagnostic test such as CDU in the out-patient setting costs Medicare over \$50 million in a single year with potential savings in the millions of dollars, consider the thousands of tests where potential savings are waiting to be realized.

Discouraging unnecessary tests such as CDU must be a multi-pronged approach by both the user and a system approach [18]. A user approach is focused on altering the physician user behavior by emphasizing the importance of eliminating unnecessary CDU or other diagnostic testing and the cost as well as potential downstream harmful procedures that may result. This tactic is already being used by insurers mandating submission of clinical information prior to approving the more expensive tests such as PET scans or MRI's. However, physician compliance with these added steps leads to increased office overhead and may delay patient care. Attention to the physician user also occurs with professional medical societies advocating to limit unneeded diagnostic testing. The 'choosing wisely' campaign is a step in this direction although only less controversial tests have been addressed and no truly demanding recommendations have yet been made. Most physicians may be aware of general guidelines but elect to order tests for understandable reasons such as reassuring families and themselves, fear of litigation and more recently concern over low patient satisfaction scores leading to decreased bonuses or compensation [17]. Fear of litigation, particularly in the United States, may cause many physicians to request confirmatory diagnostic testing. In the out-patient setting, high deductibles and self-pay patients subject to various cost sharing

insurance coverage schemes may choose to decline some testing that is not absolutely necessary. The other punitive user approach is in the form of financial penalties or disincentives as in the accountable care organization model by linking reimbursement to value based purchasing.

Utilization management departments, at least in the inpatient arena, seek to educate physicians to follow computerized algorithms and minimize testing. Ho and colleagues using a modified Delphi process and using the 'choosing wisely' list of clinical guidelines eliminated five un-necessary tests from a menu of the top twelve target tests [19]. We have previously shown that 15.3% of duplex venous scans done after hours in the emergency department in patients with suspected acute deep vein thrombosis were unnecessary if D-dimer testing and Wells scoring were utilized and could result in annual savings of \$5,285,090 for 306,307 Medicare beneficiaries alone [20].

A system approach to decrease diagnostic tests of uncertain value is now being implemented in many health systems and imaging centers. One action is to review and decrease 'routine' or 'standard' protocols for diseases or procedures where an entire specialty has an order set for repeat daily testing. Another very different direction is utilizing Clinical Decision Support Systems (CDS), which match patient characteristics to appropriateness of testing and result in algorithmic recommendations. Electronic interventions at the order entry stage using CDS systems were shown to decrease 11,470 unnecessary tests for a cost savings of \$753,667 in a single year [21]. Although currently being implemented for 'high ticket' procedures such as MRI, PET or CT scans, lesser cost procedures such as CDU can be supported by CDS. Robust CDS systems are used to 'score' requests for imaging based on appropriateness criteria. A 'green' zone (score of 7, 8 or 9) indicates appropriateness, a yellow zone (4, 5, 6 points) possibly appropriate and a red zone order indicates an inappropriate request for a diagnostic test [22]. Just as using mortality and morbidity results for major surgical procedures are posted on Hospital Compare, a public site by Health and Human Services, a scorecard for appropriateness of diagnostic imaging utilization may persuade users to put in place measures to reduce utilization [22]. Unfortunately, firm appropriateness criteria are not currently in place for many diagnostic and therapeutic procedures. Hussey and colleagues studied 113,748 orders for advanced diagnostic imaging orders by 3340 physicians and the CDS could not identify relevant appropriateness criteria for 63.3% of orders during the baseline period and for 66.5% of orders during the intervention period [23]. In addition, feedback to ordering physicians about inappropriate requests did not result in changing or cancellation of many orders. Rather than just immediate feedback, this points to the need for more aggressive measures. A more intensive effort at physician education could be used to isolate a department, specialty or a physician more likely to utilize excess testing [18].

Other ideas to curtail diagnostic testing are also being debated. More aggressive patient and public education regarding unnecessary and sometimes harmful tests possibly leading to wasteful procedures is needed. Decision-making support (healthcare coaching) for patients to enable them to reach better decisions has been shown to reduce medical costs by 5.3%, hospital admissions by 12.5 % and result in 9.9% fewer preference-sensitive procedures such as cardiac surgery [24]. Incentive based compensation tied to patient satisfaction metrics is a controversial effort and healthcare systems must avoid placing physicians in ethical dilemmas.

Physician education related to healthcare costs starting in residency programs must become a priority. Attending physicians in training programs must resist the urge to order a battery of tests to 'rule out' esoteric diagnoses and disseminate established published guidelines, when available, to residents. Physicians with less than 10 years' experience have been shown to generate 13% higher overall costs compared to their more experienced colleagues [25]. Perhaps, this is a result of younger inexperienced physicians being unable to deal with ambiguity when faced with symptoms such as syncope and dizziness. History taking and physical examination remains the mainstay of clinical judgment and confirmatory diagnostic testing is then requested.

Limitations

While estimating cost savings based on elimination of all I and half of U CDU testing may be optimistic, it is a demonstration of the potential large savings that can be obtained if guidelines are properly followed. The annual cost savings of \$2.7M for I and \$17.5 for I and half of U indications for CDU may seem small in the context of billions of dollars in spending, but this is an estimation of reducing utilization of a single diagnostic test for out-patients only.

Conclusion

With increasing emphasis by Medicare and other payers on value based reimbursement, health systems and physicians will be required to use evidence based guidelines to decrease frequency of diagnostic testing such as CDU. Based on existing guidelines, our study suggests that eliminating I CDU and some U CDU in Medicare patients can result in significant cost savings for Medicare.

References

1. Reinhardt UE (2013) Waste vs. Value in American Health Care. *The New York Times*, USA.
2. Redberg RF (2013) Getting to best care at lower cost. *JAMA Intern Med* 173: 91-92.
3. Levin DC, Rao VM, Parker L, Frangos AJ, Sunshine JH (2011) Bending the curve: the recent marked slowdown in growth of noninvasive diagnostic imaging. *AJR Am J Roentgenol* 196: 25-29.
4. Kanzaria HK, Hoffman JR, Probst MA, Caloyer JP, Berry SH, et al. (2015) Emergency physician perceptions of medically unnecessary advanced diagnostic imaging. *Acad Emerg Med* 22: 390-398.
5. <http://lowinstitute.org/home/vision-mission-history/>
6. Mohler ER, Gornik HL, Gerhard-Herman M, Misra S, Olin JW, et al. (2012) ACCF/ACR/AIUM/ASE/ASN/ICAVL/SCAI/SCCT/SIR/SVM/SVS 2012 Appropriate Use Criteria for Peripheral Vascular Ultrasound and Physiological Testing Part I: Arterial Ultrasound and Physiological Testing. A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, American College of Radiology, American Institute of Ultrasound in Medicine, American Society of Echocardiography, American Society of Nephrology, Intersocietal Commission for the Accreditation of Vascular Laboratories, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Interventional Radiology, Society for Vascular Medicine, and Society for Vascular Surgery. *J Am Coll Cardiol* 60: 242-276.
7. Navigant Center for Healthcare Research and Policy Analysis (2015) Survey: Physician Leadership Development Moving Into High Gear. USA.
8. The Kaiser Family Foundation (2015) The Facts on Medicare Spending and Financing. The Kaiser Family Foundation, USA.
9. Yee KM (2008) GAO: DRA cut 2007 imaging expenses by \$1.7 billion. Aunt-Minnie, USA.
10. The Kaiser Family Foundation (2013) Projected Medicare Spending 2013-2023. The Kaiser Family Foundation, USA.
11. Satiani B (2011) Impact of the Patient Protection and Affordable Care Act on vascular imaging. *Ann Vasc Surg* 25: 985-989.
12. Johnson AN, Appel GL (1984) DRGs and hospital case records: implications for Medicare case mix accuracy. *Inquiry* 21: 128-134.
13. Hsia DC, Krushat WM, Fagan AB, Tebbutt JA, Kusserow RP (1988) Accuracy of diagnostic coding for Medicare patients under the prospective-payment system. *N Engl J Med* 318: 352-355.
14. Chapman S (2014) Beware of Poor Coding Habits. Spring City, USA.
15. Goldstein LB (1998) Accuracy of ICD-9-CM coding for the identification of patients with acute ischemic stroke: effect of modifier codes. *Stroke* 29: 1602-1604.
16. Scott JW, Schwartz AL, Gates JD, Gerhard-Herman M, Havens JM (2014) Choosing wisely for syncope: low-value carotid ultrasound use. *J Am Heart Assoc* 3.
17. Kachalia A, Berg A, Fagerlin A, Fowler KE, Hofer TP, et al. (2015) Overuse of testing in preoperative evaluation and syncope: a survey of hospitalists. *Ann Intern Med* 162: 100-108.
18. Khalifa M, Khalid P (2014) Reducing Unnecessary Laboratory Testing Using Health Informatics Applications: A Case Study on a Tertiary Care Hospital. *Procedia Computer Science* 37: 253-260.
19. Ho T, Dukhovny D, Zupancic JA, Goldmann DA, Horbar JD, et al. (2015) Choosing Wisely in Newborn Medicine: Five Opportunities to Increase Value. *Pediatrics* 136: 482-489.
20. Mouawad NJ, Go MR, Haurani MJ, Moseley M, Satiani B (2015) Elimination of medically un-necessary duplex venous scanning based on an established algorithm can result in significant cost savings under Medicare for the institution and the taxpayer. *Journal of Vascular Surgery* 3: 107-112.
21. Procop G (2014) Improved Test Utilization through Clinical Decision Support: Better Care at a Lower Cost.
22. Clark C (2015) Reducing Scans, Improving Care.
23. Hussey PS, Timbie JW, Burgette LF, Wenger NS, Nyweide DJ, et al. (2015) Appropriateness of advanced diagnostic imaging ordering before and after implementation of clinical decision support systems. *JAMA* 313: 2181-2182.
24. Veroff D, Marr A, Wennberg DE (2013) Enhanced support for shared decision making reduced costs of care for patients with preference-sensitive conditions. *Health Aff (Millwood)* 32: 285-293.
25. Mehrotra A, Reid RO, Adams JL, Friedberg MW, McGlynn EA, et al. (2012) Physicians with the least experience have higher cost profiles than do physicians with the most experience. *Health Aff (Millwood)* 31: 2453-2463.