Rapid analysis of hyperbaric oxygen therapy registry data for reimbursement purposes: Technical communication

Caroline E. Fife MD [1], Helen Gelly MD [2], David Walker, CHT [1], Kristen Allison Eckert, MPhil [3]

[1] U.S. Wound Registry, The Woodlands, Texas U.S.
[2] HyperbaRxs, Marietta, Georgia U.S.
[3] Strategic Solutions, Inc., Cody, Wyoming U.S.

CORRESPONDING AUTHOR: Caroline Fife MD – *cfife@uswoundregistry.com*

ABSTRACT

Objective: To explain how Hyperbaric Oxygen Therapy Registry (HBOTR) data of the US Wound Registry (USWR) helped establish a fair analysis of the physician work of hyperbaric chamber supervision for reimbursement purposes.

Methods: We queried HBOTR data from January 1, 2013, to December 31, 2013, on patient comorbidities and medications as well as the number of hyperbaric oxygen (HBO_2) therapy treatments supervised per physician per day from all hyperbaric facilities participating in the USWR that had been using the electronic medical record (EHR) for more than six months and had passed data completeness checks.

Results: Among 11,240 patients at the 87 facilities included, the mean number of comorbidities and medications was 10 and 12, respectively. The mean number of HBO_2 treatments supervised per physician per day was 3.7 at monoplace facilities and 5.4 at multiplace facilities. Following analysis, reimbursement of HBO_2 chamber supervision was decreased to $112.06.

Conclusions: Patients undergoing HBO_2 therapy generally suffer from multiple, serious comorbidities and require multiple medications, which increase the risk of HBO_2 and necessitate the presence of a properly trained hyperbaric physician. The lack of engagement by hyperbaric physicians in registry reporting may result in a lack of adequate data being available to counter future challenges to reimbursement.

INTRODUCTION

The majority of hyperbaric oxygen (HBO_2) therapy treatments in the United States (88.7%) occur in hospital-based outpatient clinics [1]. A properly credentialed advanced practitioner who provides "physician attendance and supervision of hyperbaric oxygen therapy," may bill each treatment under Current Procedural Terminology (CPT®) code 99183 [2]. The Undersea and Hyperbaric Medical Society (UHMS) has detailed training recommendations for physicians who would supervise HBO_2 therapy and has enumerated the various activities that comprise this service [3]. The Medicare reimbursement rates for all physician servicesare established via a complex methodology utilizing data provided by the American Medical Association (AMA)/Specialty Society Relative Value Scale Update Committee (RUC), which values the "relative work" and practice expense of CPT codes and makes recommendations regarding valuations to the Centers for Medicare and Medicaid Services (CMS) [4]. In 1994, CMS (then Health Care Financing Administration) arbitrarily assigned HBO_2 supervision a value of 2.34 RVUs (relative value units) without going through the customary valuation by the RUC [5]. The AMA/RUC Relativity Assessment Workgroup monitors utilization of physician services; in 2013, 99183 was flagged as "utilization over 250,000" [6,7], with 558,912 claims filed for HBO_2 supervision [5]. The RUC noted that they had never reviewed these frequently reported services. Therefore, they recommended

KEYWORDS: hyperbaric oxygen, comorbid, reimbursement, registry, wound

a survey of physicians rendering HBO_2 therapy to determine the "work" required to perform the supervision of a hyperbaric treatment and, in the non-facility setting, the direct practice expenses for the RUC meeting in early 2014.

When the RUC's usual physician survey methodology failed to provide the necessary information, RUC members requested that the specialty societies (American College of Emergency Physicians and UHMS) obtain the data needed to set a new reimbursement rate for CPT 99183. Failure to provide the RUC with the requested data would certainly have increased the likelihood of a significant downward adjustment in physician payment after RUC re-evaluation. The RUC request for information was time-sensitive; data were to be provided to them within the same day for the following questions:

1) What is the average number of comorbid medical conditions among patients treated with HBO_2?
2) What is the average number of medications taken?
3) What is the average number of patients supervised per day by a hyperbaric physician at a monoplace chamber facility? and
4) What is the average number of patients supervised per day by a hyperbaric physician at a multiplace chamber facility?

The purpose of this article is to explain how the Hyperbaric Oxygen Therapy Registry (HBOTR), jointly sponsored by the UHMS and the US Wound Registry (USWR) [8], was quickly able to provide national data on thousands of patients who underwent HBO_2 in order to help establish a fair analysis of the physician work of hyperbaric chamber supervision.

METHODS

The HBOTR and the USWR

The HBOTR data are a subset of the USWR [8], which has been submitting quality measure data to Medicare on behalf of physicians since 2008 and has been a Qualified Clinical Data Registry (QCDR) since 2014 [9]. To achieve participation in a hyperbaric registry at a national level, we harnessed new electronic health record (EHR) requirements to automate registry data submission so that no secondary data entry was involved, no monetary incentive was necessary, and no funding was required. At the time of the RUC request, 129 hospital-based outpatient hyperbaric facilities were participating in the USWR and were using a purpose-built EHR. This EHR guides the physician through the possible choices of various relevant ICD-9-CM diagnosis codes (after October 2015, ICD-10 codes) so that the correct diagnosis code is ultimately selected. Clinical data entry utilizes standard vocabularies and "click and scroll" menu options, with very limited use of "free text." Computers are present in every room; the nurse and physician perform point of care documentation, with the program running off a server at the EHR vendor's computing cloud. The entire EHR on all patients is transmitted to the registry so that there is no patient selection bias. Facilities and physicians are motivated to perform complete documentation, because a unique feature of the EHR is that it internally audits the chart to derive both the physician and the facility billed level of service, thus ensuring accurate billing. Clinicians and facilities commit to registry participation for the purpose of benchmarking and federally mandated quality reporting on behalf of providers, so registry participation is not dependent on an individual clinician's or hospital's commitment to clinical research.

Data transmitted to the registry include all medications, all comorbid conditions, laboratory tests, orders, electronic prescriptions, all medical procedures (including HBO_2 treatments with their dates), and problem outcomes. We defined comorbid conditions to include all diagnoses that were not linked to the diagnosis for which HBO_2 was provided. For example, if the patient was treated for a diabetic foot ulcer, then neither the diabetes nor the foot ulcer was considered "comorbid," because those combined diagnoses represented the indication for HBO_2 therapy. However, if the patient underwent HBO_2 for the late effects of radiation therapy but also had diabetes, then diabetes was considered a comorbid condition

Patient data are updated nightly. Computerized systems parse the structured data found in the files and store the data in one of the registry databases. Once the data are available in the database, data can be queried for benchmarking, quality reporting, or specialized data projects that support public policy such as the

RUC request. The rich data repository allows for many possible research projects to be performed, and new projects can be identified at any time. An independent institutional review board (The Woodlands IRB) reviews data use proposals as they arise and ensures protection of health information.

The AMA RUC process and request

Physician reimbursement is determined by the place of service: between-facility (usually inpatient and outpatient hospital settings) and non-facility or office settings. The physician work RVUs in any venue encompasses the time, technical skill and effort, mental effort, judgment, and the stress associated with providing the service. The valuation of physician payment follows a complex formula comprising the physician work RVU (2.34), the practice expense (0.86, which accounts for non-physician clinical and nonclinical costs), and the malpractice expense (0.25) multiplied by the conversion factor and the geographic price index [10]. Since 2005, practice expenses have been established to reflect the provision of services in the non-facility setting or office. At the time of the RUC request in early 2014, the total RVUs for 99183 in a facility setting was 3.45 for an average national payment of $123.59.

In 1994, CMS assigned the work of HBO_2 supervision to be less than critical care but more than an inpatient follow-up visit. In 2014, HBO_2 supervision was compared to the supervision of a hemodialysis patient [7]. In both instances, a complicated patient (known to the specialty trained provider) is being supervised for several hours and requires intermittent bedside attendance and immediate availability in the event of an emergency.

In order to determine the most equitable "work," the RUC needed input as to the "typical" patient undergoing HBO_2 therapy. The RUC uses varied methodologies to determine the technical skill, judgment, and stress that are components of the service in question. Validation through surveys and comparison to "like" services is typical, but for HBO_2, the RUC determined that the survey data were not seen as reliable during their meeting on January 31, 2014, and February 1, 2014. A paucity of published data and a lack of familiarity with the procedure contributed to the perception that patient complexity was low. The RUC questioned the intensity of the services that were being provided by the hyperbaric practitioner. Identifiable factors that contribute to complexity, such as the number of comorbid conditions and the inherent number of medications taken by the patients, affect the possible complications that the provider would be required to address during a typical encounter and increase the work. Therefore, during the RUC meeting in early 2014 there was an immediate need to validate the complexity of the typical patient treated with HBO_2.

For the RUC request, we queried retrospective HBOTR data from all facilities participating in the USWR that offered hyperbaric services, had been using the EHR for longer than six months, and had passed data completeness checks required for entry into the registry from January 1, 2013, to December 31, 2013. For all patients treated with HBO_2 at these facilities, we included data on the number of comorbid conditions and medications taken per patient and calculated the mean and range. We also included data on the daily number of HBO_2 treatments supervised per physician (monoplace vs multiplace facility) and calculated the mean, range, and standard deviation (SD). We provided the results to the RUC on the same day of their request for discussion at their meeting.

RESULTS

Eighty-seven facilities fully met the inclusion criteria for this analysis. They were all hospital based outpatient centers distributed across 28 states.

A total of 11,240 unique patients who underwent HBO_2 therapy comprised the dataset from all facilities. The number of comorbid conditions recorded ranged from one to 44, with a mean of 10 comorbidities per patient.

In order to provide the RUC with a general understanding of the acuity level of patients undergoing HBO_2 therapy, the author (Author 1) quickly evaluated the list of all ICD-9 codes and grouped similar diagnoses according to her best judgment. We excluded conditions that might be mistaken as indications for hyperbaric treatment such as the presence of other cutaneous ulcers (e.g., venous leg ulcers). "Related to" factors (e.g., a fall which caused a wound or compli-

don't understand this >

The physician work RVUs in any venue encompasses the time ?

cations of surgery), and minor skin issues (e.g., corns or callouses) were removed from the list. We then created a list of the 14 most common comorbid conditions. Many patients had more than one comorbid condition. In order of frequency by the number and percent of patients affected, these conditions were:

- peripheral edema or lymphedema (n = 5,755, 47%);
- peripheral arterial disease (n = 2,297, 18.8%);
- diabetes mellitus (n = 1,070, 8.7%);
- hypertension (n = 741, 6%);
- hyperlipidemia (n = 742, 6%);
- heart failure (n = 411, 3.4%);
- end stage renal disease (n = 383, 3.1%);
- pain (n = 351, 2.9%);
- coronary artery disease (n = 342, 2.8%);
- chronic obstructive pulmonary disease (n = 294, 2.4%);
- morbid obesity (n = 288, 2.4%);
- depression (n = 257, 2.1%);
- atrial fibrillation (n = 253, 2%); and
- anemia (n = 218, 1.8%).

We used a similar approach with regard to the number of medications taken by patients who underwent HBO_2 therapy. The minimum number of medications was one; the maximum was 62. The mean number of medications recorded for patients who underwent HBO_2 among all centers was 12.

The RUC asked how many hyperbaric treatments per day on average were supervised by a physician at either a monoplace or a multiplace facility. There were at least eight multiplace facilities and 78 monoplace facilities included in this analysis. EHR data transmitted to the HBOTR provided information on the number of physicians billing the procedure code "99183" at each facility. We analyzed the number of hyperbaric treatments that each physician billed in the time frame at each specified type of facility (e.g. mono- vs. multiplace) and used dates to determine the number of treatments billed per physician on any given day. For monoplace chambers, we deleted sites with fewer than 10 treatments over the time frame queried to remove start-up centers. Among 78 monoplace facilities, the number of treatments supervised by physicians ranged from 1.3 to 12.0, with a mean of 3.7 treatments per day and a median of 2.9 (SD 2.2). Among multiplace facilities, the number of treatments supervised per day per physician ranged from 2.0 to 10.3, with a mean of 5.4 and a median of 4.8 (SD 2.4). The results of the above queries (Table 1) were completed in approximately three hours and were immediately provided to the RUC during their meeting.

Table 1.
Answers to the American Medical Association/Specialty Society Relative Value Scale Update Committee (RUC) questions among 11,240 patients treated with hyperbaric oxygen (HBO_2) therapy of the Hyperbaric Oxygen Therapy Registry.

ITEM	NO.
comorbid conditions, top 3 listed	
edema	5,755
peripheral arterial disease	2,297
diabetes as a comorbid condition not related to a treated diabetic foot ulcer	1,070
mean no. of medications per patient	12
mean no. of patients supervised per physician per day, by type of HBO_2 facility	
monoplace	3.7
multiplace	5.4

After much debate, the RUC determined the 99183 RVUs to be 2.11 on February 1, 2014 [7]. This represents approximately a 9% decrease in the payment for hyperbaric chamber supervision, which was modified from $123.59 to $112.06 per HBO_2 treatment, based on the formula described in the Methods section.

DISCUSSION

There are multiple ways we could have grouped the ICD-9 diagnoses more descriptively. Significant "lumping" of categories was performed, affecting the reliability of the final 14 conditions, whose specific order does not matter. Our goal was to convey to the RUC in an honest way that patients undergoing HBO_2 therapy generally suffer from many relatively serious comorbid medical conditions, which increase the risk of complications from HBO_2 and necessitate the presence of a properly trained hyperbaric physician. With more time to thoughtfully consider the diagnosis groups, a more sophisticated approach to the classification of diagnoses could no doubt have been created. The same point should be made for the number of medications taken

by patients undergoing HBO_2. Exhaustive analysis of their medications would be enlightening, and it is unfortunate that there was neither time nor funding to perform it. We must emphasize that the analysis described was performed over a three-hour time frame. Although the need for speed should not be used as an excuse for inaccuracy, in this case, a major point is that the transmission of structured data from EHRs created a repository which is amenable to rapid analysis.

The field of hyperbaric medicine faces existential threats in the United States despite strong scientific rationale and compelling basic science data. Reasons include a perceived lack of sufficient high-quality evidence to satisfy some payors, a diminishing list of covered indications, increasing regulatory burdens for providers and hospitals, and reductions in reimbursement rates [11-13]. CMS acknowledges that there is scientific benefit to analyzing real-world data (14), and many physician specialty organizations use registries to determine whether clinicians follow evidence based guidelines, to compare their patient outcomes with their peers, to understand the level of illness of their patients, and to monitor safety [15]. Although clinical registries cannot prove the efficacy of a treatment, they can help determine real-world effectiveness [16]. Third party payors and governmental entities may also use registry data as part of reimbursement analyses as described herein.

HBOTR data are available to the UHMS to meet data needs that might arise. The HBOTR represents a paradigm shift from the registry model that has existed for decades. The traditional approach to registry creation is to identify the scientific questions of interest, determine the data fields necessary to answer those questions, and then design a data collection tool (paper or electronic) to capture the required data by secondary data entry [15]. This method necessitates the collection of data specifically for the purpose of the registry, usually at a time distant from patient care. Selection bias is a common problem, and the likelihood of successful registry enrollment is often inversely proportional to the number of data fields required, unless there is a financial incentive for enrollment or a payor mandate for registry submission as a condition of reimbursement [15]. No CMS or regional Medicare Administrative Carrier policy mandates registry data submission as a condition of payment for HBO_2 therapy, so no reimbursement incentive exists to drive either quality data collection or clinical research. Unfortunately, when information on comorbid conditions is not available to adequately risk stratify patients, doubts may be raised about the clinical effectiveness of HBO_2 [16]. Thus, the importance of a detailed dataset derived directly from structured language within the EHR cannot be overstated.

The passage of the HITECH (Health Information Technology for Economic and Clinical Health) Act in 2009 changed the possibilities for registry creation [17-19]. To make electronic data sharing possible, all certified EHRs must use the Health Level 7 Clinical Document Architecture [20]. At the time of analysis, the HBOTR contained data transmitted directly from the EHRs of all patients who were treated with HBO_2 at 129 facilities in the United States and were supervised by more than 400 practitioners. This data repository has been increasing as clinicians comply with the current requirement to submit data to a specialty registry as part of the "meaningful use" (MU) of an EHR. Under "Stage 2" of MU, which began in 2016, providers must transmit data directly from their EHR to a specialty registry by to avoid a 2% negative payment adjustment in their Medicare reimbursement [21]. The USWR, a 501(c)(3) non-profit organization, can now receive data from any certified EHR via the transmission of Continuity of Care Documents (CCDs). CCDs provide detailed, structured data on patients [19], without the need for any laborious secondary data entry, transmitting all ICD-10 diagnosis codes, procedures, medications, laboratory results, and demographics as part of current interoperability requirements. As a result of the MU2 mandate of 2016 (22), over 2,000 clinicians now report data to the HBOTR, which contains information on approximately 25,539 patients.

It is vital that hyperbaric practitioners engage in registry submission if they are to survive the titanic shift in healthcare payment reform under MACRA (Medicare Access & Chip Reauthorization Act of 2015) [23,24]. Participation in a QCDR counts as a Clinical Practice Improvement Activity, which is 15% of the provider's total score in MACRA's Merit Based

Incentive Payment System (MIPS). Additionally, hyperbaric practitioners who report quality measures through the HBOTR can earn bonus ports for the Quality Reporting portion of MIPS (50% of the total score), particularly if they report safety, appropriate use, or outcome quality measures. While no such hyperbaric measures are available in the Physician Quality Reporting System, the UHMS developed hyperbaric safety, outcome, and appropriate use measures in partnership with the USWR, which can be reported through that QCDR and whose data become part of the HBOTR [8]. These hyperbaric quality measures include a validated risk stratification tool called the Wound Healing Index (WHI) [25,26] that incorporates both wound and patient comorbid condition variables in the model. The WHI allows the creation of matched cohorts for comparative effectiveness studies of HBO_2 in the treatment of diabetic foot ulcers. In this way, the infrastructure created to satisfy mandatory quality and registry reporting requirements as part of healthcare reform can be harnessed to facilitate the acquisition of real-world data for HBO_2 comparative effectiveness studies.

The rapid analysis of HBOTR data for the AMA RUC demonstrated that patients undergoing HBO_2 therapy generally suffer from multiple, serious comorbidities and require numerous medications. These factors increase the risk of HBO_2 and necessitate the presence of a properly trained hyperbaric physician. There is no doubt that HBO_2 supervision will come up for RUC review in the future. Data validating the ongoing complexity of care of the patient undergoing HBO_2 therapy will need to be available in defense of the "work" that is inherent in 99183.

It is unclear whether the prospect of a decrease in Medicare Part B revenue under MIPS will be sufficient motivation for clinicians to participate in the UHMS-affiliated QCDR in the absence of any specific CMS mandate to contribute hyperbaric data. If not, lack of engagement in registry reporting by hyperbaric physicians may result in a lack of adequate data to counter future reimbursement challenges or to carry out much-needed cost-effectiveness studies. Given that the registry submission process is automated, that all certified EHRs can perform it, that MIPS virtually requires it, and that failure of an EHR vendor to agree to do so is a form of "data blocking" with penalties attached, there are few excuses not to participate.

Author disclosures here

REFERENCES

1. Wheaton Partners, LLC. CodeMap®. 2016. https://www.codemap.com/index.cfm?source=CodeMapSearch&gclid=CPMvLzwss4CFY88gQodNAwOTQ. Accessed August 8, 2016.

2. American Medical Association (AMA). Coding with CPT® for proper reimbursement. 2016. http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt.page. Accessed June 8, 2016.

3. Undersea & Hyperbaric Medical Society (UHMS). UHMS credentialing and privileging guidelines for hyperbaric medicine physicians in the U.S.A. Revised 26 June 2016. https://www.uhms.org/resources/news-announcements/108-uhms-credentialing-and-privileging-guidelines-for-hyperbaric-medicine-physicians-in-the-u-s-a.html. Accessed June 8, 2016.

4. American Medical Association (AMA). The RVS Update Committee. 2016. http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/medicare/the-resource-based-relative-value-scale/the-rvs-update-committee.page? Accessed June 8, 2016.

5. Duncan R. Important changes in Medicare code for hyperbaric cxygen therapy: FAQS & answers. Undersea and Hyperbaric Medical Society Blog. December 15, 2014. https://uhmsblog.wordpress.com/2014/12/15/important-changes-in-medicare-code-for-hyperbaric-oxygen-therapy-faqs-answers/. Accessed June 8, 2016.

6. American Medical Association (AMA) Relative Value Update Committee (RUC). AMA/Specialty Society RVS update process RUC recommendations for CPT 2016 introductory materials. October 6, 2014. https://download.ama-assn.org/resources/doc/rbrvs/october-2014-ruc-recommendations.pdf. Accessed June 8, 2014.

7. American Medical Association/Specialty Society RVS Update Committee. Summary of recommendations. CMS/other-utilization over 250,000 screen. Hyperbaric Oxygen Therapy. January 2014.

8. ClinicalTrials.gov. Bethesda. MD: National Library of Medicine; May 28, 2015. NCT02483650, Hyperbaric Oxygen Therapy Registry (HBOTR). https://clinicaltrials.gov/ct2/show/NCT02483650. Updated June 24, 2015. Accessed June 15, 2016.

9. U.S. Wound Registry. 2015. http://uswoundregistry.com/index/aspx. Accessed June 16, 2016.

10. Centers for Medicare & Medicaid Services. National Physician Fee Schedule and Relative Value Files. https://www.cms.gov/apps/physician-fee-schedule/documentation.aspx. Accessed June 16, 2016.

11. Fife CE, Eckert KA, Workman WT. Ethical issues, standards and quality control in practice of hyperbaric medicine. In: Jain KK, ed. Textbook of Hyperbaric Medicine. 6th ed. New York: Springer; 2016. In press.

12. Fife WP, Fife CE. Textbook of hyperbaric medicine. In: Jain KK, editor. Hyperbaric oxygen therapy in chronic Lyme disease. 5th ed. Germany: Hogrefe & Huber; 2009. p. 149-55.

13. Le PJ. Lessons to learn from federal convictions of HBOT fraud. Today's Wound Clinic. http://www.todayswoundclinic.com/articles/lessons-learn-federal-convictions-hbot-fraud. Accessed June 9, 2016.

14. Tunis SR. A clinical research strategy to support shared decision making. Health Aff (Milwood). 2005; 24(1): 180-4.

15. Gliklich R, Dreyer N, Leavy M, eds. Registries for evaluating patient outcomes: a user's guide. Third edition. Two volumes. AHRQ Publication No. 13(14)-EHC111. Rockville, MD: Agency for Healthcare Research and Quality. 2014. http://www.effectivehealthcare.ahrq.gov/registries-guide-3.cfm. Accessed June 14, 2016.

16. Margolis DJ, Gupta J, Hoffstad O, et al. Lack of effectiveness of hyperbaric oxygen therapy for the treatment of diabetic foot ulcer and the prevention of amputation: a cohort study. Diabetes Care. 2013; 36(7): 1961-1966.

17. Stark P. Congressional intent for the HITECH Act. Am J Manag Care 2010; 16(12 Suppl HIT): SP24-SP28.

18. Fife CE, Walker D, Thomson B. Electronic health records, registries, and quality measures: What? Why? How? Adv Wound Care (New Rochelle). 2013; 2(10): 598–604.

19. Mennemeyer ST, Menachemi N, Rahurkar S, Ford EW. Impact of the HITECH act on physicians' adoption of electronic health records. J Am Med Inform Assoc. 2016; 23(2): 375-379.

20. Health Level Seven® International. HL7 implementation guide for CDA® release 2: IHE health story consolidation, release 11 - US realm. https://www.hl7.org/implement/standards/product_brief.cfm?product_id=258. Accessed June 9, 2016.

21. Centers for Medicare & Medicaid Services. Payment adjustment information. www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/PQRS/Payment-Adjustment-Information.html. Accessed June 16, 2016.

22. Centers for Medicare & Medicaid Services. EHR incentive programs. 2016 program pequirements. Modified April 8, 2016. https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/2016ProgramRequirements.html. Accessed June 9, 2016.

23. Centers for Medicare & Medicaid Services. The merit-based incentive payment system (MIPS) & alternative payment models (APMs). Available at: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMS/MACRA-MIPS-and-APMS.hml. Accessed June 9, 2016.

24. Centers for Medicare & Medicaid Services. Quality payment program. https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/NPRM-QPP-Fact-Sheet.pdf. Accessed June 9, 2016.

25. Horn SD, Fife CE, Smout RJ, Barrett RS, Thomson B. Development of a wound healing index for patients with chronic wounds. Wound Repair Regen. 2013; 21(6): 823-832.

26. Fife CE, Horn SD, Smout RJ, Barrett RJ, Thomson B. A predictive model for diabetic foot ulcer outcome: The Wound Healing Index. Advances in Wound Care. 2016; 5(7): 279-287.

✦