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Does incorporation of a clinical support template in the electronic medical record improve capture of wound care data in a cohort of Veterans with diabetic foot ulcers?

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Abstract

Purpose—The purpose of this cohort study was to evaluate the effect of a 1 year intervention of an electronic medical record wound care template on the completeness of wound care documentation and medical coding compared to a similar time interval for the fiscal year preceding the intervention.

Methods—From October 1, 2006 to September 30, 2007, a “good wound care” intervention was implemented at a rural VA facility to prevent amputations in veterans with diabetes and foot ulcers. The study protocol included a template with foot ulcer variables embedded in the electronic medical record to facilitate data collection, support clinical decision making, and improve ordering and medical coding.

Results—The intervention group showed significant differences in complete documentation of good wound care compared to the historic control group ($\chi^2 = 15.99$, $p < 0.001$); complete documentation of coding for diagnoses and procedures ($\chi^2 = 30.23$, $p < 0.001$); and for complete documentation of both good wound care and coding for diagnoses and procedures ($\chi^2 = 14.96$, $p < 0.001$).

Conclusions—An electronic wound care template improved documentation of evidence-based interventions and facilitated coding for wound complexity and procedures.

Keywords

diabetic foot ulcer; documentation; medical coding

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Conflict of interest: none

Introduction

Comprehensive data on chronic wounds such as diabetic foot ulcers exists in conjunction with some wound centers, but few databases exist that contain detailed information on patients with chronic wounds. In the VA system, providers enter assessment, diagnostic, and procedural data directly into the Computerized Patient Record System (CPRS) during each patient encounter. Electronic medical record information historically has been recorded via free-text, leading to both inter- and intra-provider inconsistencies in wound documentation discovered by medical record audits prior to this study.

Guidelines exist for the provision and documentation of “good wound care”, including: performing a global assessment, measuring wounds, treating invasive bacterial infection, offloading pressure, debriding devitalized tissue, providing moist wound healing, and scheduling regular follow-up care^{1–7}. Barriers to guideline-concordant wound care and documentation of care include lack of provider education, complexity of treatment, and confusion about diagnostic and procedure codes. Fife and colleagues⁸ proposed that utilizing an automated clinical support in the electronic medical record would decrease the burden of remembering and implementing wound care treatments, and by making the clinical guidelines available at the point-of-care, it would facilitate the provision of optimal wound care.

In addition to accurately documenting assessment and treatment, it is important to correctly code the complexity of the encounter by identifying all additional diagnoses and procedures that affect care. This is necessary to evaluate whether the patient received the level of wound care appropriate to the complexity of the wound. For example, if the documentation for the additional complexity of angiopathy, neuropathy, or Charcot deformity is not included in the patient record at the time of the encounter, valuable data is lost. Quality wound data is needed to correctly assess the burden of disease, determine treatment strategy, and allocate resources.

Therefore, the purpose of this study is to compare frequency of 1) elements of “good wound care” documentation and 2) coding for complexity and procedures between two sequential cohorts of veterans with diabetic foot ulcers. We hypothesized that use of an electronic documentation template would improve capture of wound care data.

Methods

This study follows a prospective consecutive cohort of foot ulcer patients with diabetes and a historic comparison cohort. Data from a regional VA database and computerized patient medical records were collected for two years on cohorts of veterans with diabetes and foot ulcers treated at a rural VA facility⁹. The implementation group was followed from October 1, 2006 to September 30, 2007 and the historical control group of veterans with diabetes treated at the same facility for foot ulcers during a year two years prior to the intervention period was also identified. The gap in time periods allowed for specialized wound care education, training, and protocol development for the intervention. An electronic wound care template was used to prospectively collect intervention patient data.

The research setting is the Jonathan M. Wainwright Memorial Walla Walla VA Medical Center (VAMC); a non-tertiary care center serving more than 65,000 veterans who reside in a 14 county catchment area¹⁰. Outpatient medical care at the Walla Walla VAMC for this study’s time period was provided by 10 primary care providers. Human Subjects approval to conduct this study was secured from the University of Washington and the VA Multi-Site Human Subjects Committees.

The cohorts for this study were identified based on at least one visit for a diabetic foot ulcer at the Walla Walla VAMC during the historic control period (October 1, 2003 through September 30, 2004) or the intervention period (October 1, 2006 through September 30, 2007). Eligibility criteria for both cohorts were 1) the patient had a diagnosis of diabetes; 2) the patient had at least one ulcer below the malleoli; and 3) the ulcer was not primarily attributable to other causes of skin ulceration on the foot.

Study Procedures

Data for this study were drawn from 3 sources. First, regional data on veterans are maintained in a Consumer Health Information Performance Set (CHIPS) database from select uploaded electronic medical record (Computerized Patient Record System (CPRS) data via the Veterans Health Information Systems & Technologies Architecture (Vista). A query of CHIPS for patients with medical codes for diabetes and foot ulcers was utilized to identify the historic control cohort. Second, the electronic medical record is available at each VHA health care facility for review and with authorization CPRS records at other facilities can be reviewed. This data source includes images, text notes, laboratory, and pharmacy records. Clinicians enter data directly on each patient encounter into CPRS. Pre-intervention wound care encounters were documented via free-text by the clinical providers. Finally, research records were reviewed from the intervention study period⁹. Research records included medical record abstraction, wound images, and patient and staff surveys. Images and surveys were compared to medical records for clarification of data points.

CPRS documentation for the intervention period involved the use of a “Diabetic Foot Ulcer (DFU) Template” for each patient encounter. The template was embedded in the electronic medical record to facilitate data collection, support clinical decision making, and improve procedure ordering and medical coding by cueing the provider to document elements of good wound care and appropriate wound codes (see image, Supplemental Digital Content 1, which is a computer screen-print from the diagnostic coding portion of the template).

Seven elements of “good wound care, debriding callus and devitalized tissue, measuring the wound, treating invasive bacterial infection, offloading weight, providing moist wound healing, providing a global assessment, and scheduling regular follow-up care evaluated in a prior study⁹ were operationally defined as indicating good wound care in the context of this study (Table 1). The baseline visit for each qualifying ulcer during the two-year period (control and intervention) was evaluated for percent compliance with these elements of good wound care and for completeness of medical coding for encounter complexity and procedures. A qualifying ulcer was identified as the first incident ulcer for which a veteran with diabetes sought care at the facility during the study time periods. Compliance with each element was evaluated by a research nurse who is a certified wound care specialist.

Using the electronic medical record, each baseline encounter was assessed for level of complexity of care and procedures performed. A research nurse who was also a certified wound nurse that had medical coding training assigned an appropriate complexity (ICD-9-CM) or procedure (CPT) code to each encounter component. The 7 elements of good wound care and the 2 elements of coding were deemed essential for documentation of wound care (Table 1). Each criterion element was scored as present (yes) or absent (no) for each baseline encounter during the two time periods.

Data Analysis

Medical records, administrative and template data were analyzed for the presence or absence of 9 critical elements of wound documentation (Table 1). A descriptive analysis of the demographic characteristics of each cohort was also performed (Table 2). Equal weight was

given to each item. Data analysis was performed by comparing binary variables using the chi-square test of homogeneity to determine significance of documentation differences between the two time periods. The 2 groups were determined to differ significantly on specific characteristics if the p-value associated with a specific comparison was less than 0.05 (Table 3).

Results

The patient sample included 27 veterans in the historic control cohort and 49 in the intervention cohort. Their mean ages were 67 ± 9.37 vs. 65 ± 11.16 (mean $\pm$ SD). Both groups were male patients and all participants had Type II diabetes mellitus. For this study, well-controlled diabetes was defined by a HgBA1C $<8\%$. There was no significant differences based on race, ethnicity, control of diabetes (63% vs. 67% , $\chi^2=0.15$, $p < 0.7000$), history of amputation, or diagnosis of neuropathy. There was a statistically significant difference in diagnosis of angiopathy (71% vs. 44% , $\chi^2= 5.37$, $p < 0.020$); this difference may be partially attributable to an increased use of arterial-brachial-index testing to detect angiopathy during the data collection period after introduction of the intervention.

Analysis revealed statistically significant differences in all 7 factors comprising good wound care and the 2 elements used to evaluate coding. Specifically, the intervention group showed significant differences in complete documentation of good wound care (43% vs. 0% , $\chi^2 = 15.99$, $p < 0.001$); complete documentation of coding for diagnoses and procedures (69% vs. 4% , $\chi^2 = 30.23$, $p < 0.001$); and for complete documentation of both good wound care and coding for diagnoses and procedures (41% vs. 0% , $\chi^2 = 14.96$, $p < 0.001$).

DISCUSSION

Documentation of important wound care variables improved with incorporation of a template in the electronic medical record, but it was still not ideal. One of the reasons documentation was still not optimal was that the clinicians could leave sections of the template blank. They could also fail to check all of the appropriate medical codes for that encounter. For example, if a patient had been previously diagnosed with angiopathy, it would affect the care of the foot ulcer, and it should be included in the coding for the wound care encounter. However, this was not done consistently, even with the use of the template. In the VA setting, documentation does not impact patient care reimbursement as it does in the private sector, thus the incentive to correctly identify all medical codes may differ from that experienced by professionals in other health systems.

Complete and accurate documentation of wound care is important not only as a record of the care provided, but also as a source of data for wound care research. A study of a large for-profit wound care provider database revealed that specific wound data can be very accurate compared to the medical record if the database contains detailed information¹¹. Kantor and Margolis¹¹ examined the quality of the data in the database as a way to assess the reliability and validity of using the database to study patients with diabetic foot ulcers, and they reported achievement of 90% agreement between the database and the medical record on three key wound care variables 1) diagnosis, 2) treatment, and 3) wound healing.

In contrast, inadequate documentation in turn may result in incomplete capture of wound care data. For example, Kenegaye and associates¹² studied the effect of a structured encounter form for improving documentation of wound care in a pediatric emergency department. They found a significantly higher rate of complete wound care documentation with structured encounter forms than with free-text dictation (80% vs. 68% , $p < 0.001$). A German study also found that a database with complete documentation of more than 7,000

chronic wounds over a 2-year period could be created with the implementation of a standardized computer wound documentation system¹³. Using data collected for the database, the authors were able to calculate predicted healing time for chronic wounds within the first two years of treatment. Significant effects on wound healing were factors of patient compliance, grading of wound depth, and patient age ($p < 0.001$ for all)¹³. This same group of German researchers used a computerized wound database to create a wound-based severity score for diabetic foot ulcers¹⁴ and to predict wound healing in diabetic patients based on 50% wound size reduction at 4 weeks¹⁵.

Limitations

In this relatively small one-setting study, the ability to generalize our results is limited. In reviewing the care provided, we cannot know whether there was any discrepancy between what was done and what was documented. However, by comparing records of relatively homogenous cohorts, improvements in data capture due to an electronic documentation template can be highlighted.

Recommendations

Better documentation of wounds using templates is now part of comprehensive wound care in many care settings. A template with predefined elements of good wound care assists in provider awareness, measuring and documenting components of good wound care and tracking wound care outcomes. This information brings additional clarity about changing the course for a nonhealing wound. Better wound documentation is also anticipated to improve accuracy of ICD coding and potential reimbursement.

Conclusion

Improvement and standardization of wound care documentation and data collection is needed. Documentation templates within electronic medical records may be one way to improve data capture for chronic wounds. The value of the information provided by the structured data collected is a better understanding of where to target future interventions for optimizing wound care outcomes.

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Table 1

Essential Wound Care Documentation Variables

		References
Elements of Good Wound Care	Debride Callus & Devitalized Tissue	Edwards, Stapley 2010 ¹⁶ Steed, et al 1996 ¹⁷ Mayfield, et al 2004 ¹⁸
	Wound Measurement	Jeffcoate, et al. 2006 ¹⁹ Margolis, et al 2002 ²⁰
	Infection Treatment	O'Meara, et al 2010 ²¹ Lipsky, et al 2004 ²²
	Offloading	Spencer, 2000 ²³
	Moist Wound Healing	Margolis, et al 1999 ²⁴
	Global Assessment	Rith-Najarian, et al 1998 ²⁵
	Schedule Follow-up	Rith-Najarian, et al 1998 ²⁵ Horswell, et al 2003 ²⁶
Coding	Appropriate Complexity Code	Golinko, et al 2009 ²⁷ Harwell, et al 2001 ²⁸ Markowitz, et al 2007 ²⁹
	Appropriate Procedural Code	Golinko, et al 2009 ²⁷

Table 2

Demographic Characteristics

	Control Group (n=27)	Intervention Group (n=49)	χ^2
Age (mean)	67 ($\pm$ 9.37)	65 ($\pm$ 11.16)	
Gender (male)	27 (100%)	49 (100%)	
Race			<i>p=0.060</i>
White	20 (74%)	44 (90%)	
Black	2 (7%)	0	
Asian/Native Hawaiian or other Pacific Islander	2 (7%)	1 (2%)	
Not stated	3 (11%)	4 (8%)	
Ethnicity			<i>p=0.572</i>
Hispanic or Latino	0	1 (2%)	
Not Hispanic or Latino	24 (89%)	45 (92%)	
Not stated	3 (11%)	3 (6%)	
Diabetes (Type 2)	27 (100%)	49(100%)	<i>p=0.700</i>
Controlled	17 (63%)	33 (67%)	
Uncontrolled	10 (37%)	16 (33%)	
History of Amputation			<i>p=0.843</i>
No	22 (82%)	39 (80%)	
Yes	5 (18%)	10 (20%)	
Neuropathy			<i>p=0.154</i>
No	6 (22%)	5 (10%)	
Yes	21 (78%)	44 (89%)	
Angiopathy			<i>p=0.020</i>
No	15 (59%)	14 (29%)	
Yes	12 (44%)	35 (71%)	

Table 3

Frequency Wound Care Variables Documented Comparing Free-Text vs. Template

		Control Period (n=27)	Intervention Period (n=49)	Pearson χ^2
Elements of Good Wound Care	Debridement	2 (7%)	29 (59%)	19.32, $p < 0.001$
	Measurement	2 (7%)	45 (92%)	52.59, $p < 0.001$
	Infection Assessed	15 (56%)	47 (96%)	18.87, $p < 0.001$
	Offloading	6 (22%)	41 (84%)	27.86, $p < 0.001$
	Moist Wound Healing	0	38 (78%)	41.88, $p < 0.001$
	Global Assessment	0	34 (69%)	33.90, $p < 0.001$
	Schedule Follow Up	24 (89%)	49 (100%)	5.67, $p = 0.042$
Coding	Appropriate Complexity Code	3 (11%)	36 (74%)	27.10, $p < 0.001$
	Appropriate Procedural Code	20 (74%)	46 (94%)	5.98, $p = 0.029$
Complete Documentation of Good Wound Care		0	21 (43%)	15.99, $p < 0.001$
Complete Documentation of Appropriate Coding		1 (4%)	34 (69%)	30.23, $p < 0.001$
Complete Documentation of Good Wound Care AND Appropriate Coding		0	20 (41%)	14.96, $p < 0.001$