

25

WOUND CARE AND PRESSURE ULCERS

Improved quality and comprehensiveness in nursing documentation of pressure ulcers after implementing an electronic health record in hospital care

Lena Gunningberg, Marie Fogelberg-Dahm and Anna Ehrenberg

Aims. One aim was to compare the quality and comprehensiveness in nursing documentation of pressure ulcers before and after implementation of an electronic health record in a hospital setting. Another aim was to investigate the use of preformulated templates for pressure ulcer recording in the electronic health record.

Background. With the possibilities of the electronic health record to provide information and give accurate and reliable feedback to the healthcare organisation, it is of high priority to develop standardised documentation practices for various areas of care (e.g. such as pressure ulcer care).

Design. A cross-sectional retrospective review of health records.

Methods. Three departments in a Swedish university hospital participated. In 2002, there were 413 patients, including 59 paper-based records identified with notes on pressure ulcers and in 2006, 343 patients, including 71 electronic health records with pressure ulcer recording. Recorded data on pressure ulcers were retrospectively reviewed.

Results. Significantly more patient records showed notes of pressure ulcer grade ($p < 0.001$), size ($p = 0.004$), risk assessment ($p = 0.002$), nursing history ($p = 0.040$), nursing diagnoses ($p < 0.001$), nursing goals ($p < 0.001$) and nursing outcomes ($p = 0.016$) in 2006 than in 2002. One third of the recordings used preformulated templates.

Conclusions. Although there were significant improvements in pressure ulcer recording after the change to the electronic health record, several deficiencies remained. Due to the short time of our follow-up after implementation of the electronic health record, we suspect that the quality of recording will improve when nurses become more familiar with the new system.

Relevance to clinical practice. Education related to the use of the electronic health record and evidence-based pressure ulcer prevention should be provided to the nurses. To facilitate documentation, the templates need to be refined to be more user-friendly.

Key words: electronic health record, nursing documentation, nursing process, pressure ulcer, record audit

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Background

Pressure ulcers are commonly used as a quality indicator for nursing care and regarded as a feasible area for improvement

because of the considerable knowledge about risk factors and preventive actions that are available (Institute of Healthcare Improvement, IHI 2006). The prevalence of pressure ulcers is high in hospitalised patients and has been reported to vary

Authors: *Lena Gunningberg*, PhD, RN, Leader of Nursing Research & Development, Surgery Division, Uppsala University Hospital; and Associate Professor, Department of Surgical Science, Uppsala University, Uppsala, Sweden; *Marie Fogelberg-Dahm*, RN, MSc, Development Department, Uppsala University Hospital, Uppsala, Sweden, and Electronic Patient Record Administration Group, County Council, Uppsala, Sweden; *Anna Ehrenberg*, PhD, RN,

Associate Professor, School of Health and Social Sciences, Högskolan Dalarna, Falun, Sweden

Correspondence: Lena Gunningberg, Surgery Division, Uppsala University Hospital, 751 85 Uppsala, Sweden. Telephone: +46 18 611 31 94.

E-mail: lena.gunningberg@akademiska.se

between 14–25% (Whittington & Briones 2004, Woodbury & Houghton 2004, Vanderwee *et al.* 2007). Thus, there is a great need for continuous measurement of both the prevalence and incidence of pressure ulcers in health care. So far, the methodology recommended to obtain reliable data has been observation of patients by pairs of data collectors (Vanderwee *et al.* 2007). With the possibilities of the electronic health record (EHR) to provide information and give fast feedback to the healthcare organisation, it is of high priority to develop standardised documentation practices for various areas of care, including pressure ulcer care.

However, several studies have shown serious shortcomings in the documentation of nursing care in health records (Gunningberg *et al.* 2000, Idvall & Ehrenberg 2002). For instance, data are often lacking and existing information is not specific enough (Ehrenberg *et al.* 2004). In addition, many studies have shown lack of comprehensiveness in recording, which may impede overview of the care process (Ehrenberg & Birgersson 2003). These deficiencies have consequences for the quality and safety in care in that errors could occur and the continuity of care for patients may be hampered.

In 1986, it became mandatory in Sweden for nurses to keep patient records, which includes demands for structured recording in coherence with the nursing process. The VIPS model (acronym for the Swedish spelling of Well-being, Integrity, Prevention and Safety) was developed with the purpose of conceptualising the essential elements of nursing care, clarifying and facilitating systematic thinking and nursing recording (Ehnfors *et al.* 1991, Ehrenberg *et al.* 1996). The model is based on the nursing process with keywords within different levels to support structured recording. Keywords on the first level are nursing history, nursing status, nursing diagnosis, goals, nursing interventions, nursing outcomes and nursing discharge notes. The keywords on the second level are elaborated for nursing history, status and interventions. Examples of keywords in relation to nursing status are 'nutrition' and 'skin' and nursing interventions include, for example, 'support' and (adaptation of) 'environment'. This model is the most prevalent common structure for nursing documentation in Swedish health care (Ehrenberg *et al.* 1996).

In 2002, a pressure ulcer prevalence survey was conducted in a Swedish university hospital using the methodology developed by the European Pressure Ulcer Advisory Panel (EPUAP) (Vanderwee *et al.* 2007, Gunningberg 2004). Subsequently, a comprehensive quality improvement programme was initiated (Gunningberg & Stotts 2008), including information to nurse managers, education on different levels of the hospital organisation and development of clinical guidelines and identification of pressure ulcer as a quality

indicator at the hospital level. Because an EHR was going to be implemented hospital-wide in 2004–2005, special focus was on the development of research-based templates for risk assessment (Ek *et al.* 1997), pressure ulcer grading (EPUAP 1999) and standard care plans to facilitate adequate documentation in the EHR.

To conclude, standardised recording allows the use of data from EHR to learn about health care, preventive actions and outcomes of care interventions. Thus, EHR can be used for efficient compilation of data from nursing care to provide feedback to the healthcare staff on their care performance. Such feedback could be an important element in the continuous quality improvement work in health care that can facilitate comparisons over time as well as benchmarking between units. Moreover, the use of structured formats for nursing recording of specific patient problems and interventions can constitute a basis for a 'minimum data set' for describing nursing care quality (Goossen 2000). Although knowledge is limited, research has shown improved quality of documentation after introducing EHRs (Mahler *et al.* 2007, Gunningberg *et al.* 2008). However, little is known about the effects of introducing preformulated templates for specific content in the healthcare record.

Aim

The aim of this study was to compare the quality and comprehensiveness of nursing documentation of pressure ulcers before and after implementation of an EHR in hospital care. Another aim was to investigate the use of preformulated templates for pressure ulcer recording in the EHR.

Method

A cross-sectional, descriptive, comparative, pre-post test design with retrospective review of health records was used.

Sample

All records in 2002 ($n = 413$) and 2006 ($n = 343$) from patients at the Departments of Surgery, Orthopaedics, Medicine and Geriatrics of a Swedish 1000-bed university hospital were audited retrospectively for the presence of recording on pressure ulcer care. Surgical and orthopaedic units will be defined in the present study as 'surgical department'. In 2002, 59 paper-based records were identified with notes on pressure ulcers and in 2006, 71 EHR were identified. Data from these records were retrieved from a retrospective period of three months (maximum time) based on all patients cared for at the hospital departments during

Table 1 Patient characteristics before and after implementation of the electronic health record

	Geriatric department		Surgical department		Medical department		Total	
	2002 (N = 20)	2006 (N = 39)	2002 (N = 20)	2006 (N = 19)	2002 (N = 19)	2006 (N = 13)	2002 (N = 59)	2006 (N = 71)
Gender, n (%)								
Women	11 (55.0)	22 (56.4)	7 (35.0)	10 (52.6)	13 (68.4)	6 (46.2)	31 (52.5)	38 (53.5)
Men	9 (45.0)	17 (43.6)	13 (65.0)	9 (47.3)	6 (31.6)	7 (53.8)	28 (47.5)	33 (46.5)
Age, mean (SD)	81.8 (8.2)	81.5 (9.4)	78.2 (15.0)	79.6 (15.3)	81.6 (8.3)	80.2 (10.9)	80.5 (10.9)	80.7 (11.3)
Length of stay, mean (SD)	47.4 (42.3)	36.3 (28.4)	14.6 (13.4)	20.5 (22.2)	12.1 (8.8)	11.2 (12.5)	24.9 (30.6)	27.5 (26.4)
	Med 34.5	Med 30.0	Med 12.5	Med 10.0	Med 10.0	Med 8.0	Med 15.0	Med 18.0

one day in 2002 and 2006. Patient characteristics were similar in the two samples, with slightly more women than men (mean age 80 years). The mean length of stay was 24.9 days in 2002 and 27.5 in 2006 (Table 1).

Instruments

Two data collection forms were used: the EPUAP Pressure Ulcers Prevalence instrument modified for record review and the Comprehensiveness in Nursing Documentation instrument.

Record audit of pressure ulcer documentation

An audit instrument for review of patient records regarding pressure ulcers was developed by the present researchers based on the EPUAP protocol (Vanderwee *et al.* 2007). This instrument was used in a previous study (Gunningberg & Ehrenberg 2004). The modified instrument included items on patient background data, pressure ulcer grade, size and location, risk assessment and nursing interventions, such as pressure relieving devices and repositioning in bed or chair.

Comprehensiveness in nursing documentation

A five-point scale was designed to assess the comprehensiveness of nursing documentation on the prevention and treatment of pressure ulcers (Ehnfors & Smedby 1993) using the following scoring criteria:

- Score 1. The problem is described or interventions planned or implemented.
- Score 2. The problem is described and interventions planned or implemented.
- Score 3. The problem is described and interventions planned or implemented and nursing outcome is recorded.
- Score 4. The problem is described and interventions planned and implemented and nursing outcome is recorded.
- Score 5. All aspects of the nursing process are recorded. Good description of the problem and recording of the relevance for nursing.

According to Swedish law and regulations from 1993 (SFS 1985:562, SOSFS 1993:17, 1993:20), a score of four should be required to judge the record as adhering to standards, i.e. that the nursing problem is described, the nursing intervention has been planned and implemented and the nursing outcome has been recorded.

Procedure

Health records for all included patients were identified in the hospital's record archives (2002) and in the EHR system (2006). All records, including admission assessment notes, nursing care plans, progress notes and medication prescriptions, were read to identify any documentation pertaining to pressure ulcers. If such notes were found, the record was included and photocopied and the audit was completed using the two audit instruments. Pairs of undergraduate nursing students in their final term, one pair surveying each clinical area in 2002 and 2006, performed the audit with the guidance of the present researchers. Before data collection, the students received training in record audit using the specific instrument to ensure inter-rater reliability. To obtain reliability in the audit of records the present researchers performed independent reviews of 10% of the patient records and then inter-rater agreement was computed. Cohen's kappa values varied between 0.57–1.0 (83–100%), which was judged to be fair to excellent agreement (Fleiss & Chilton 1983).

Data analysis

Descriptive data were analysed using spss Version 14.0 for windows (SPSS Inc., Chicago, IL, USA). The chi-square was used to compare groups for dichotomous variables. When cells had an expected count of less than five, Fisher's exact test was performed. Values of $p < 0.05$ were considered statistically significant.

Severity of pressure ulcers was identified based either on a clear definition of pressure ulcer grade 1–4 according to

an internationally established grading system (EPUAP 1999), or on a written description corresponding to a grade. The identification of size of pressure ulcers was based on estimations in centimetres or visual representations. The location of pressure ulcers was based on documentation of body location (e.g. right heel and buttocks). Risk assessment was defined as either documentation of clinical judgement expressed as 'at risk' or findings of risk using a validated risk assessment tool (e.g. the Modified Norton Scale) (Ek *et al.* 1997). Pressure ulcer diagnoses were identified based on a distinct diagnostic statement, prioritised as a major problem for the patient or included as an analysis in the care plan as a basis for nursing interventions. The preventive actions in bed or chair, based on the EPUAP protocol, were: no special equipment (standard mattress/cushion), non-powered equipment (e.g. low-pressure foam mattress/cushion) or powered equipment (any device with an electrical supply). Planned manual repositioning intervals, if any, were audited. However, other preventive measures were considered in the review (e.g. heel cushion).

Research ethics approval

Permission for the study was obtained from the medical directors at each department and approval was obtained from the Research Ethics Committee of the Faculty of Medicine at Uppsala University (No. 03-012). To ensure anonymity of the patients all personal identification in the records was removed before photocopying and all data were treated confidentially.

Results

The presentation of the pressure ulcer data in the records varied somewhat between the two data collection periods. In 2002, notes were largely in free-text format in the paper-based records, whereas recording in 2006 was in electronic format and partly standardised based on preformulated templates. Overall, nursing recording was structured in accordance with the VIPS model.

Quality of nursing documentation of pressure ulcers

Significantly more patient records showed notes of pressure ulcer grade ($p < 0.001$), size ($p = 0.004$) and risk assessment ($p = 0.002$) in 2006 than in 2002 (Table 2). However, there were still deficiencies. Of 71 patient records, 24 (33.8%) had documentation of pressure ulcer grade, 27 (38.2%) described the size and 36 (50.7%) showed evidence that the nurse had

performed a risk assessment, either based on clinical judgement or using a validated instrument.

Comprehensiveness in nursing documentation of pressure ulcers

The nursing documentation included significantly more nursing diagnoses ($p < 0.001$), nursing goals ($p < 0.001$) and nursing outcomes ($p = 0.016$) in 2006 compared with 2002, whereas notes on nursing history ($p = 0.040$) had decreased. In 2006, there were 20 (28.2%) of 71 patient records that reached the comprehensiveness score of 4 or more, which can be compared with nine (15.3%) of 59 in 2002. However, this difference did not reach statistical significance ($p = 0.054$) (Table 3).

Nursing documentation based on preformulated templates for pressure ulcer recording

As shown in Table 4, the templates for pressure ulcers were used in 142 recordings (29%) of all documentation of pressure ulcer grade, size, location, risk assessment, nursing diagnosis, goals and planned interventions. The remaining 344 recordings (71%) were written in free-text format, some of which were similar to the expressions in the corresponding template.

To describe pressure ulcer grade, templates for grade 1–4 (according to EPUAP guidelines) were provided in the EHR. Nevertheless, 109 (91%) of the recordings were written in free-text format with unspecific descriptions, such as 'redness' or 'has an ulcer'. Three fixed responses in centimetres were provided to indicate size of pressure ulcers, which was used in three (11%) of the recordings. Instead of such measures, nurses sometimes used coins as a representation (such as 'size of a one krona'). Localisation of the ulcer was only based on the templates in seven (10%) of the recordings. Nurses sometimes used the same expressions as in the template, although written in free text (e.g. 'sacrum' or other unspecific descriptions, such as 'behind' or 'buttocks'). Risk assessment was quite frequently (63%) based on templates and often represented by using the Modified Norton scale, which was provided as a template. Nursing diagnoses were, for the most part (78%), described by using templates, such as 'Risk of pressure ulcers related to inactivity'. Goals in the care plans were mostly written in free-text format (71%) (e.g. 'Intact skin' or 'Prevent pressure ulcers'), as were planned interventions (73%) (e.g. 'Pressure-relief', 'Daily skin inspection' and 'Turning schedule') (Table 4). No templates were included for such recordings in the EHR, therefore, patient outcomes and evaluation of care were only written in free-text format.

Table 2 Nursing documentation (*n*) of risk assessment, pressure ulcers and prevention before and after implementation of the electronic health record

	Geriatric department		Surgical department		Medical department		Total		<i>p</i> -value
	2002 (<i>N</i> = 20)	2006 (<i>N</i> = 39)	2002 (<i>N</i> = 20)	2006 (<i>N</i> = 19)	2002 (<i>N</i> = 19)	2006 (<i>N</i> = 13)	2002 (<i>N</i> = 59)	2006 (<i>N</i> = 71)	
Pressure ulcer									
Grade	0	13	0	8	0	3	0	24	<0.001
Size	5	16	2	7	2	4	9	27	0.004
Location	20	39	19	18	18	12	57	69	0.618
Risk assessment	7	25	1	10	6	1	14	36	0.002
Prevention									
Pressure-reducing equipment (bed)	4	14	6	6	8	6	18	26	0.463
Planned repositioning (bed)	10	18	11	6	10	8	31	32	0.396
Pressure-reducing equipment (chair)	2	6	0	1	2	0	4	7	0.530
Planned repositioning (chair)	0	1	0	0	0	1	0	2	0.194

Table 3 Comprehensiveness in nursing documentation (*n*) of pressure ulcers before and after implementation of the electronic health record

	Geriatric department		Surgical department		Medical department		Total		<i>p</i> -value
	2002 (<i>N</i> = 20)	2006 (<i>N</i> = 39)	2002 (<i>N</i> = 20)	2006 (<i>N</i> = 19)	2002 (<i>N</i> = 19)	2006 (<i>N</i> = 13)	2002 (<i>N</i> = 59)	2006 (<i>N</i> = 71)	
Nursing history	2	0	0	0	2	0	4	0	0.040
Nursing status	20	38	20	19	18	13	58	70	0.704
Nursing diagnosis	1	23	2	3	2	0	5	26	<0.001
Nursing goals	0	21	0	1	1	0	1	22	<0.001
Nursing interventions									
Planned	16	33	11	9	17	11	44	53	0.993
Implemented	14	26	14	16	12	10	40	52	0.497
Nursing outcome	3	19	4	7	4	1	11	27	0.016
Score $\geq 4^a$	3	16	3	4	3	0	9	20	0.054

^aA score of 4 is required by law (SFS 1985:562, SOSFS 1993:17, 1993:20).

Table 4 Nurses' use of templates vs. free text for recording pressure ulcer care in the electronic health record (*N* = 71)

Record content	Template, <i>n</i> (%)	Free text, <i>n</i> (%)	Total
Grade	11 (9)	109 (91)	120
Size	3 (11)	25 (89)	28
Location	7 (10)	62 (90)	69
Risk assessment:	15 (63)	9 (37)	24
Clinical judgement			
Risk assessment:	25 (100)	0 (0)	25
Modified Norton score			
Nursing diagnosis	32 (78)	9 (22)	41
Nursing goals	6 (29)	15 (71)	21
Planned nursing interventions	43 (27)	115 (73)	158
Total	142 (29)	344 (71)	486

Discussion

Comparing 2006 with 2002, the overall results show significant improvements in the documentation of pressure ulcer grade, size and risk assessment, as well as nursing diagnosis, nursing goals and nursing interventions. Only one-third of the recordings were documented with the preformulated templates in the EHR.

Even if the nursing documentation of pressure ulcers improved, there were still obvious deficiencies. The documentation did not reflect evidence-based nursing according to national and international guidelines (Ek *et al.* 1997, EPUAP, 1998, McInnes *et al.* 2008, IHI 2006). To assure patient safety it should be a requirement that every patient with risk of pressure ulcers is identified and that every pressure ulcer is described with grade, size and location in the record. Only 20

of 71 EHRs with recordings of pressure ulcer care reached the score of 4, meaning that a nursing problem (i.e. pressure ulcer) was described, nursing interventions were planned and implemented and nursing outcomes was recorded (SFS 1985:562, SOSFS 1993:17, 1993:20). The EHR has the potential to facilitate a dynamic comprehensive documentation in which, e.g. nursing outcome can be recorded by appropriate key words and not in chronological order. However, changing documentation practice takes time. There were no improvements in the documentation of preventive actions, such as pressure-reducing equipment and repositioning. However, a recent observational study showed that patients received pressure-reducing equipment to a higher degree (51.6%) than was actually documented in the patient record (7.9%) (Gunningberg *et al.* 2008).

The EHR implementation process varied somewhat between the various clinical departments, which may explain some of the variation in recording practice. In both the geriatric and medical departments, the EHR supported documentation according to the nursing process. This was not the case, however, in the surgical department, where preformulated templates for pressure ulcers were implemented in the admission and discharge note only. Thus, of the total sample of 71 EHRs, it was not possible to use templates for nursing diagnoses, goals and planned intervention in the 19 records from the surgical department. In the geriatric department where the greatest change was found, the involvement from leadership was more persuasive and special effort was directed towards the recording of pressure ulcers, including a facilitator for the quality improvement work at the department level. The impact of this function is not known but might account for some of the improvement, which would be in line with the conclusions from a systematic review of the literature showing that the use of local opinion leaders can successfully promote evidence-based practice (Doumit *et al.* 2007). The documentation did not improve in the medical department, even if the EHR supported documentation according to the nursing process and that templates were provided.

The findings show that, in general, nurses documented pressure ulcer care in free-text format. Nurses often used less specific descriptions (e.g. grading and location of pressure ulcers), even though templates with standardised expressions were available. In the case of recording the location of ulcers, nurses only used preformulated expressions in 10% of the recordings and sometimes even used identical words in free text as was available as a template. One explanation for the limited use of templates might be that the preformulated expressions were perceived as unfamiliar and deviating from what nurses traditionally use. On the other hand, it seems as though the templates were used when they were familiar (the

Modified Norton scale) or supported recording perceived by the nurses as difficult to express (e.g. nursing diagnoses). In some cases, the templates could have been perceived to be imprecise. Concerning recording of the size of ulcers, three preformulated choices were presented, although sparsely used by the nurses. Because such notations need to be specific to facilitate evaluation of ulcer healing, this finding is understandable. The nurses predominantly chose a free-text format for recording of interventions.

A systematic review found that audit and feedback can be effective in improving professional practice (Jamtvedt *et al.* 2006). The templates in the EHR have the potential to generate data for such feedback. The balance between data that should be recorded with preformulated templates (enabling statistics) and data in free-text format (allowing individual expressions) has to be discussed and determined. Therefore, a quality improvement project was initiated and feedback on pressure ulcer incidence was sent monthly to each nurse manager in the surgical department. However, the implementation of a hospital-wide EHR required a great deal of resources to manage and operate the daily documentation of patient care and the development of a system for feedback could not be prioritised. A Canadian study (Clarke *et al.* 2005) identified lack of visible nursing leadership, time required to acquire computer skills and difficulties with the computer system as barriers to a successful implementation of an EHR. Timmons (2003) also described nurses' reluctance in using a computerised system. Further studies need to consider the impact of contextual factors (e.g. leadership and nurses' perception) to gain a better understanding of the complexity in the implementation of new technology and new guidelines for documentation.

Methodological considerations

There are three limitations that need to be acknowledged and addressed regarding the present study. First, because it was not possible to conduct the study with an experimental design, no firm conclusions can be made about the impact of the EHR alone. Second, the time for the follow-up measurement varied somewhat and was only one year after the introduction of EHR in some of the departments. Third, unfamiliarity with the new technology and with the standardised terminology may have been obstacles in nurses recording even after the implementation.

Conclusion

Although there were significant improvements in pressure ulcer recording after the change to EHR, deficiencies still

existed in the content of nurses' documentation. Comprehensiveness was still lacking, restricting the ability to get an overview of the pressure ulcer care process and preformulated templates were only partly used to guide recording. The quality of recording should improve when nurses get more acquainted with the new computer-based documentation system. Therefore, it is of interest to continue research on documentation within the EHR and to test the impact of evidence-based templates on the quality and comprehensiveness of nurses' documentation and its ultimate impact on patient care.

Relevance to clinical practice

Adequate documentation is a prerequisite for patient safety. Education related to how to use the EHR, as well as evidence-based pressure ulcer prevention should be provided to the nurses. Because standardised documentation is necessary for feedback from the computerised system, it is also important to refine the templates so they become user-friendly and facilitate documentation. The nurses also need to recognise that the quality of the documentation is essential for feedback of quality indicators (e.g. pressure ulcers). The electronic patient record has the potential to be a powerful source of information for auditing quality in health care. Therefore, nurses and managers need to engage in the development of reliable and efficient record systems.

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Contributions

Study design: LG, AE; data analysis: LG, MFD, AE and manuscript preparation: LG, MFD, AE.

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