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Research article

Losing weights: failure to recognise and act on weight loss documented in an electronic health record

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ABSTRACT

Background Involuntary weight loss is associated with higher mortality. When this weight loss is unrecognised, opportunities for timely diagnosis of significant conditions may be missed.

Objective To use electronic health record (EHR) data to estimate the frequency of unrecognised involuntary weight loss and its implications.

Methods We performed a retrospective analysis of the weights recorded in an EHR of 100,000 adult patients seen in outpatient clinics over a 5-year period using a novel data visualisation and review tool. We reviewed charts of a random sample of 170 patients experiencing weight loss periods. Our outcomes included 1) determination of whether weight loss was voluntary versus involuntary; 2) determination of whether weight loss was recognised and documented and 3) possible explanations identifiable at the index visit or within the subsequent 2 years.

Results Of 170 randomly selected weight loss periods reviewed, 22 (13%) were involuntary, 36 (21%) were voluntary and 112 (66%) were indeterminate. Sixty-six (39%) weight loss periods were recognised by clinicians at the index visits and an additional 3 (1%) at the next PCP visits. Possible explanations for weight loss emerged in the subsequent 2 years including medical conditions in 60 (45%), psychosocial conditions in 19 (14%), erroneous data entry in 9 (7%), voluntary weight loss in 8 (6%) and postpartum weight loss in 6 (4%). No possible explanations were found in 32 (24%).

Conclusions Periods of weight loss were common, often involuntary and frequently not recognised or documented. Many patients with involuntary weight loss had potential explanations that emerged within the subsequent 2 years.

Keywords: delayed diagnosis, diagnostic errors, electronic health records, medical errors, weight loss

INTRODUCTION

Weight loss occurs in 1.3%–13.3% of the general adult population and up to 27% of patients 65 years and older.[1–4] It may be voluntary or simply reflect poor functional status in the elderly, but can also be a sign of various diagnosed or undiagnosed conditions such as cancer, and is associated with disease severity and increased mortality.[1,5–8] Weight loss is also associated with an increased risk of in-hospital complications, care utilisation, hospitalisation and poor quality of life.[9–12] One important reason that weight loss is important to recognise in the ambulatory setting is that it may signify a potentially treatable disease or an opportunity to intervene for a far-ranging group of conditions including depression, gastrointestinal or endocrine diseases, polypharmacy, infections and cancer.[13–18]

Although early weight loss identification offers a unique opportunity for the clinician to potentially intervene on modifiable risk factors or anticipate complications, current practices on weight documentation, weight loss recognition and screening are variable. Current data show that weight loss is under-recognised[19] although the exact frequency or impact of this recognition failure has not been well studied. Recognition and tracking of weight and weight loss have assumed a new dimension with the increased use of electronic health records (EHRs), particularly as a consequence of the American Recovery and Reinvestment Act passed in 2009, which designated adult weight screening and follow-up as one the three core meaningful use quality measures that clinicians are required to report.[20–25] However, despite the increasing electronic recording of patient weights, it is uncertain whether clinicians will recognise and document their assessment and actions for patients who do lose weight. Therefore, we performed a study to describe clinician recognition, assessment and documentation of weight loss in a large outpatient longitudinal EHR.

This study was designed to answer the following questions: 1) what is the prevalence of significant weight loss and what patterns are evident? 2) For patients who have significant weight loss, how many had their weight loss noted by their physicians? 3) What proportion of patients who lost significant amounts of weight have voluntary versus involuntary loss? 4) How well do physicians document voluntary weight loss and how often do physicians give an assessment of the cause(s) of involuntary loss? And 5) what clinical outcomes in the form of new, potentially missed diagnoses emerge in the 2-year period following an episode of significant weight loss?

METHODS

After obtaining approval from our Institutional Review Board, we created a random sample of 100,000 patients seen in the outpatient practices affiliated with Brigham and Women's Hospital, a large academic medical centre in Boston for a 5-year period (2005–2009). Within this retrospective sample, we identified those patients with at least two weights recorded within 180 and 365 days apart that showed a weight loss of at least 10 pounds. The 10-pound screening threshold was selected as the minimal value that most clinicians

would agree constituted true weight loss rather than normal weight fluctuation between visits, and had been used in prior published studies on involuntary weight loss.[26,27]

We then selected a random sample of 1000 of the screen-positive patients and analysed their weight data using a linear regression-based approach to identify discrete periods of weight loss, plateau and weight gain. The use of regression lines to indicate changes in weight was intended to remove noise in the weight data. For each patient's weight data, we started with an analysis 'window' that began on the date of the first recorded weight and was 395 days (1 year plus 1 month) wide. We calculated a regression line through the data within the window and labelled the window as 'loss' if the slope of the line indicated a loss of at least 10% per year, 'gain' if it indicated a gain of at least 10% per year and 'plateau' otherwise. In this phase of the study, we opted for the 10% per year threshold (instead of 10 pounds per year) to further reduce the noise in our data. We then advanced the window in 30-day increments and repeated the procedure until we reached the end of the recorded data. Consecutive windows with the same label (i.e. 'loss', 'gain' or 'plateau') were consolidated into 'periods' with the same labels. Within each weight loss period, we identified an 'index visit', at which there was a reasonable expectation that the provider would have recognised the weight loss. The 'index visit' was defined as the first visit in the period at which the weight was at least 10% lower than that at the start of the period (Figure 1).

A board-certified internist (Valeria Pazo) reviewed the electronic outpatient records of a random sample of 170 weight loss patients' periods to determine: 1) the type of provider at index visit (i.e. PCP versus specialist); 2) whether the weight was documented and if so, in which part of the note; 3) whether the weight loss was recognised; 4) if recognised, whether the clinician noted any possible causes and 5) whether a new diagnosis explaining the weight loss emerged within the next 2 years following the index visit. Recognition of weight loss was defined as the noting of weight loss in any part of the physician's progress note. The results of the review were recorded on a customised database form created in Microsoft Access (Microsoft, Inc., Redmond, Washington; Figure 2). A set of 20 weight loss periods of the 170 reviewed by the initial reviewer was reviewed by a second board-certified internist (Robert El-Kareh) to assess reproducibility of the reviews. We calculated Cohen's kappa statistics to assess reviewer agreement in determinations of whether weight loss was recognised by providers at the index visit, provider assessments of whether weight loss was voluntary and presumed cause of weight loss after the review of the chart for the 2 years following the index visits.

RESULTS

In our initial sample of 100,000 patients, 77,477 (77%) had at least one weight recorded, 59,964 (60%) had two or more weights recorded, 43,906 (44%) had at least one pair of weights that were 180–365 days apart and 14,680 (15%) had a pair of such weights showing a decrease of at least 10 pounds. Within the 1000 randomly selected screen-positive patients,
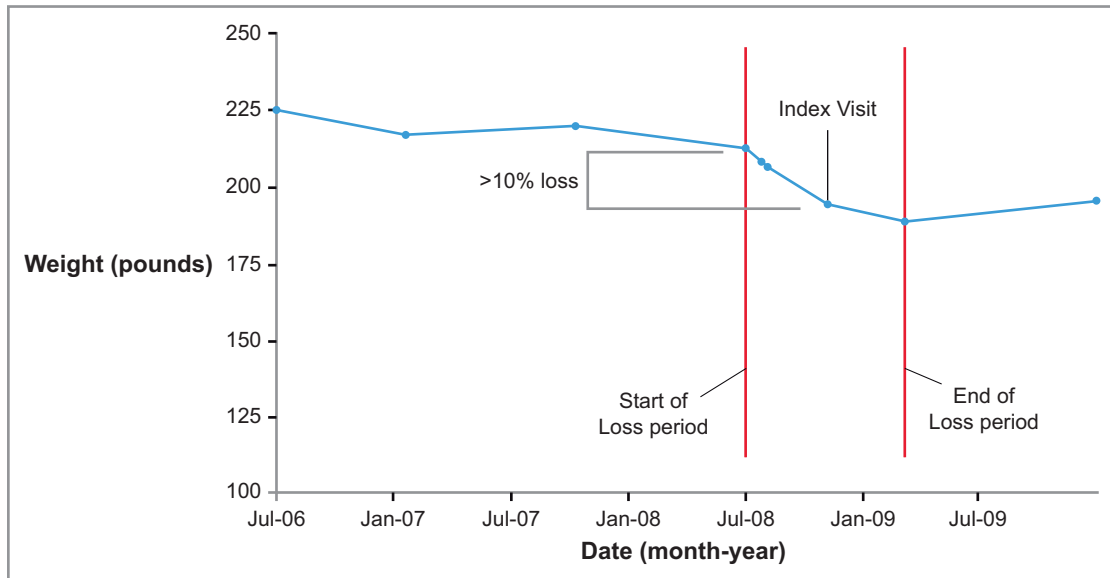
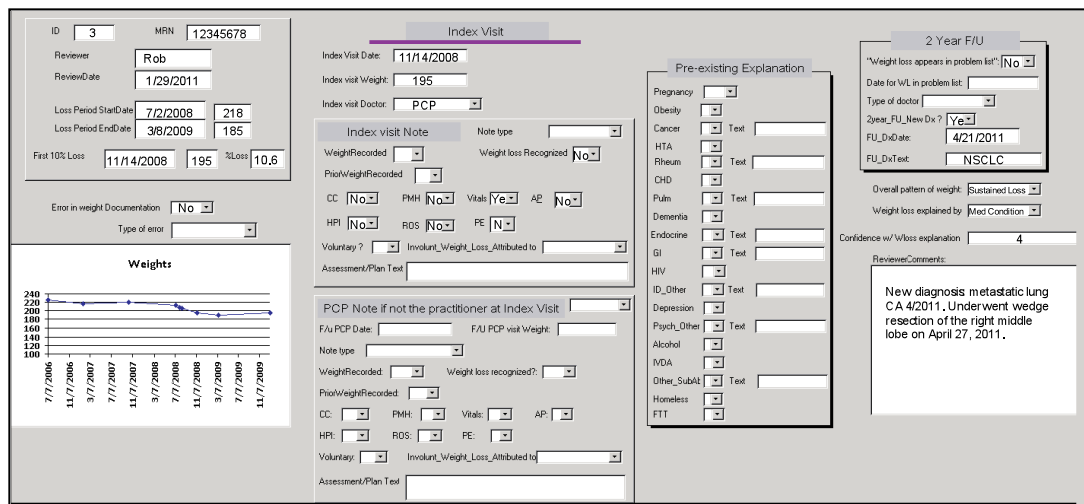**Figure 1.** Identification of weight loss period and index visit

Figure 2. Weight loss period review tool

our linear regression-based analysis identified 577 distinct weight loss periods, from which we selected a random sample of 170 (30% random sample) for a detailed chart review.

The results of our review of index visits are summarised in Table 1. A visit with a primary care provider was the most common index visit type (48%). The patient's current weight was recorded in the note at the index visit in most visits (68%), but the notation or comparison with the prior weight was much less common (16%). There was evidence that the provider recognised that weight loss had occurred in 39% of the index visit notes and an additional 1% of subsequent PCP visits. Thus, for more than half of the patients, recognition of this significant weight loss was not noted. In 13% of index visit notes, the provider documented that the weight loss was involuntary. However, in the majority (66%) of index visit notes, there was no documentation of the provider's assessment as to whether the weight loss was voluntary or involuntary. In addition, 93% of these notes did not include the weight loss

in the assessment and plan. For a large majority of index visit notes (84%), a presumed or hypothesised cause for the weight loss was not documented. Notes that did mention the weight loss and potential causes included a variety of recognised causes such as malignancy, gastrointestinal disease and depression.

Looking at 2 years of notes that followed the index weight loss visit, we found documentation of new diagnoses that could explain the initial weight loss in 29% of the cases not documented as voluntary (Table 2). The largest proportion of these new diagnoses involved medical conditions (49%). Approximately one-fifth (19%) remained without any documented condition that would explain the weight loss. Reviewer agreements (kappa statistics) for the assessments of whether there was documentation and recognition of weight loss, whether the weight loss was voluntary and the presumed causes of weight loss after chart review of the 2-year periods following the index visits were 0.90, 0.83 and 0.60, respectively.

Table 1. Index visit characteristics and documentation

Characteristic	n (%)
Type of provider at index visit (n = 170)	
Primary care	82 (48)
Oncology	37 (22)
Surgery	13 (8)
Obstetrics–Gynaecology	8 (5)
Cardiology	8 (5)
Other	22 (13)
Documentation of weight and recognition of weight loss (n = 170)	
Current weight recorded	116 (68)
Prior weight recorded	27 (16)
Weight loss recognised	66 (39)
Section of note mentioning weight or weight loss (n = 170)	
Chief complaint	4 (2)
History of present illness	24 (14)
Past medical history	0 (0)
Vital signs	61 (36)
Physical examination	46 (27)
Assessment and plan	12 (7)
Assessment of whether weight loss was voluntary (n = 170)	
Voluntary	36 (21)
Involuntary	22 (13)
Not documented	112 (66)
Cause attributed to non-voluntary weight loss at index visit (n = 134)	
Malignancy	6 (4)
Gastrointestinal	6 (4)
Infectious	1 (1)
Rheumatological	1 (1)
Depression	4 (3)
Other psychiatric	2 (1)
Social issues	2 (1)
Not documented	112 (84)

Table 2. Description of new diagnoses identified within two years of index visits

Characteristic	n (%)
New diagnosis documented within two years of index visit (n = 134)	
Yes	39 (29)
Types of new diagnoses possibly explaining weight loss (n = 134)	
Medical condition	60 (45)
Cancer	36 (27)
Non-cancer GI conditions (e.g. IBD, IBS and complicated diverticulitis)	9 (7)
Other medical conditions	15 (11)
Psychiatric/social condition	19 (14)
Voluntary weight loss	8 (6)
Postpartum	6 (4)
Erroneous data entry	9 (7)
Unexplained/unknown	32 (24)

DISCUSSION

We performed a retrospective cross-sectional analysis at a large academic medical centre to assess the frequency of recognition and assessment of weight loss documented in an EHR. We found that the current patient weight was recorded in the notes of most of the visits at which the patient lost 10% of his/her weight since the start of their weight loss period. However, changes in weights (number of pounds or percentages) were documented much less frequently and the 'weight loss' was rarely mentioned in the assessments and plans. Upon review of the charts for ensuing 2 years following the index visits, we frequently identified new medical diagnoses that may have explained the weight loss. In a number of these patients, the unrecognised weight loss might have provided an initial signal or clue.

One of the first challenges in performing a study of outpatient weight loss was to develop an operational definition of what constituted weight loss. It quickly became apparent that a definition could not be as simple as losing a certain number of pounds between two visits or two arbitrary points in time because patients' weight data could often vary considerably. It would be difficult to expect that such arbitrary thresholds would or should be consistently recognised. For example, obese patients might frequently lose 10 pounds, but this would not necessarily be a 'red flag' for serious involuntary weight loss. To overcome this, we used a regression analysis approach to focus on trajectories over time rather than simple differences in weight. Thus, we were able reduce the 'noise' in the data and align more with realistic clinical trajectories and a clinician's thought process.

Our chart reviews highlighted the difference among three important aspects of the documentation and assessment process: 1) having weight data recorded in the note; 2) recognising that the weight had dropped and 3) creating a patient-specific assessment and plan related to the loss. EHRs have made the automatic recording of weights possible and current weights were frequently automatically populated in the records we reviewed, mostly when other vital signs were 'clicked' to be entered. However, it is not clear that such 'documentation' has improved the other aspects of weight loss assessment. This automatic importing of data elements (e.g. weight, vital signs, laboratory results and medication lists) may actually create an additional barrier to the conscious and consistent recognition of important changes in some of these elements.[28] Innovative approaches to the design of EHR interfaces that better support provider cognition[29] may help to address this barrier, but are not features of current commercial products.

The high proportion of patients with significant weight loss that did not have a specific acknowledgement or plan to address the loss was striking. Given the retrospective nature of the study that was based solely on recorded documentation, it was impossible to determine whether the providers recognised the magnitude of the weight loss and felt it did not warrant mention in the assessment and plan or whether the extent of the loss remained unrecognised. For those cases in which the weight loss was unrecognised, or recognised but unaddressed, clinical decision support, such as automated inferences with targeted alerting,[30] may provide a mechanism to avoid undesirable delays in diagnosis or management.

The clinical impact of delayed recognition of weight loss proved difficult to quantify. Medical conditions that may have led to the initial weight losses can progress over the course of several months to years. However, weight loss itself is a non-specific finding and the mere presence of a condition that could cause weight loss did not mean that it did actually cause the weight loss for that particular patient. This uncertainty was amplified as the time between the onset of the weight loss and a new diagnosis that may have emerged increased, and is reflected in the lower agreement in presumed causes of weight loss between the two reviewers. Our findings do not provide any specific guidance for strategies to diagnose unexplained weight loss as decision making would need to be tailored to each patient. Nonetheless, weight loss must be recognised to initiate that process.

Our study also had other limitations. The chart reviews were primarily conducted by a single reviewer, although unclear cases were discussed using a consensus process. A second internist also independently reviewed a subset of charts, and we found that agreement was moderate to high for assessments, so it is unlikely that a second reviewer would have led to substantial changes in the results. We also targeted the notes for one specific visit for each patient (the 'index visit' as defined above). Had more clinical notes been assessed for a given patient, we would have found a lower incidence of weight loss being overlooked. Another limitation was that we evaluated cases from a single institution. Documentation practices may vary by institution and by particular features of specific EHRs, so this may limit the generalisability of our results. However, automatic importing of data elements into notes is a feature common to commercial EHRs, and the issues we identified are likely widespread and are particularly relevant as EHRs become more widely used. Finally, in the chart review of the 2-year periods following the index visits, the attributions of the initial weight loss to subsequent diagnoses were subjective and difficult to validate given the retrospective nature of the study.

CONCLUSIONS

Periods of weight loss at rates greater than 10% per year occurred frequently in ambulatory general medicine at a large academic medical centre. Current patient weights were often recorded, but weight changes were recorded and recognised much less frequently. A significant weight loss, even greater than 10% per year, was rarely mentioned in the assessment and plans of reviewed notes. New diagnoses that may have explained the weight loss often emerged within 2 years, and failure to recognise weight loss may have led to diagnostic delays of some of these patients.

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Conflicts of interest

The authors have no conflicts of interest to disclose.

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