Narrative-Based Collaborative e-learning in an Evidence-Based World

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Summary

Objectives. The objective of this paper is twofold. First it describes an attempt to develop an innovative e-learning blended narrative approach to undergraduate teaching/learning of statistics in health sciences based on patient-centred medicine. The second aim was to involve the students and a multi-professional staff in the web-based collaborative analysis of a sample of illness narratives in order to integrate qualitative and quantitative methods.

Materials and Methods. A virtual classroom was set up composed of the students frequenting the course in medical statistics and a multi-professional teaching staff. The course was structured as a sequence of jumps from clinical to statistical learning issues, and vice versa. The students conducted non directive interviews of patients, and were assigned the task of finding scientific papers relating to the main content of the narratives. The transcripts of audio-taped illness narratives were downloaded onto the web-based application MEANINGS.

Results. A web-based repository of illness narratives was obtained. An ontological conceptualisation of narratives as dynamic networks of episodes was developed. In this way, the students were involved in a process of co-construction of knowledge.

Conclusions. Narrative-centred e-learning environments can provide intriguing worlds in which students become involved in the highly non linear process of scientific discovery.

KEY WORDS: *qualitative and quantitative methods, collaborative e-learning, narrative based medicine, patient-centred medicine.*

Introduction

The present paper describes an attempt to develop an innovative approach to undergraduate teaching/learning of statistics in health sciences.

The key assumption is that patient-centred medicine (PCM) (1, 2) and the bio-psycho-social approach (3) could make it possible to avoid the fragmentation of medical knowledge which characterises modern medicine.

However, the main challenge is that PCM seems to be at odds with the formal/quantitative intrinsic nature of statistical sciences.

In fact, the main criticism levelled at the statistical approach in medicine focuses on the apparent contradiction between each patient's so-called singularity or uniqueness and statistical results that instead describe collective groups of individuals or abstract populations (4).

So, medical statistics is perceived as oriented towards research issues rather than geared to the practicalities of the medical profession. Evidence-based medicine (EBM) and quantitative studies are viewed as the results of the application of esoteric methods which must be transformed into a set of simple rules to be applied almost deterministically in medical practice.

However, the supporters of PCM also question the biomedical model in which patients' reports of ill-

ness are taken to indicate the existence of disease processes. This model has led to the development of hyper-specialised medical domains and to the fragmentation of medical knowledge. In this context, the wholeness of the patient's illness is lost, and the result is a clinical method focused on identifying and treating standard disease entities. To this end, the patient's illness is translated into a set of signs and symptoms which must be investigated and interpreted by means of more or less standardised diagnostic procedures. Accurate diagnoses are, in turn, the basis for the selection of appropriate treatments which, it is hoped, will restore the health status to 'normal'. Ideally, therapy is chosen on the basis of sound scientific evidence stemming from clinical trials.

Most statistical research relies upon this biomedical model, and clinical trials usually take it that the diagnosis was correct and definite.

So, the supporters of PCM see the reductionistic biomedical model and medical statistics as being somehow mutually supportive. But they challenge the key assumption of the 'biomedical model', i.e. that illness and disease are coterminous, because many illnesses in community settings cannot adequately be allocated to conventional disease taxonomies. The biomedical model is also strongly questioned by nurses because it contrasts with their typically holistic approach to health care (5).

These considerations are the basis of the development of wider explanatory frameworks. For example, in Engel's 'bio-psycho-social model' (3), disorders are conceptualised as existing at a number of interacting levels (from biological to psychological and social levels). Thus, PCM conceives of the patient as an experiencing individual rather than as the object of some disease entity.

In this framework, narrative approaches have become popular in counselling, too, because attending to the history of a patient's illness involves exploring both the presenting symptoms and the broader life setting in which they occur (6-8).

The main limitation of this approach is that illness narratives are viewed as surrogates for psychological counselling, whereas in fact they could conceal unexplored information. Hence, the formal, scientific method should also be applied to the analysis of illness narratives, and narratives themselves should be regarded as data.

Traditionally, narratives are analysed by means of qualitative methods, e.g. content analysis (9), which can be carried out using several computer programs. In medicine, there has recently been growing interest in qualitative research, and some authors argue in favour of the integration of qualitative and quantitative methodologies in systematic reviews (10).

From an educational point of view, a pedagogical model aimed at integrating qualitative and quantitative methods could involve students in an intriguing learning environment and expose them to these fundamental questions early on in their university curriculum. To this end, innovative educational formats and tools should be developed and tested.

In this framework, communication technologies could play a crucial role. On the basis of these considerations, an educational "experiment" was carried out at the Faculty of Medicine of the University of Naples Federico II. The main objective was to develop a situated, blended, collaborative constructivist e-learning environment for the integration of narrative-based medicine (NBM) with EBM.

Materials and methods

A virtual classroom was set up using the DVLN (Dynamic Virtual Learning Networks, http://elearning. medicina.unina.it/dvln) system.

In addition, a dedicated e-learning web-based system, MEANINGS, was developed which enabled the participants to formulate an ontological conceptualisation of illness narratives (http://elearning.medicina.unina.it/associazioni).

The course of medical statistics (first semester of the first year) was structured as a sequence of weekly modules. Each module began with a one-hour clinical seminar during which a physician briefly presented a clinical problem that was to be solved through the acquisition of statistical information. An online discussion forum was also activated. Then, two hours of interactive lessons on the statistical concepts underlying the clinical problem were given. The module ended with a one-hour interdisciplinary seminar exploring the connections between statistical and clinical issues. There were repeated jumps from clinical (qualitative) issues to statistical (quantitative) issues, and vice versa, until all the aspects of

the elementary statistics course had been covered. At this point, the concept of the illness narrative was introduced in order to go beyond the biomedical model and to introduce some elements of qualitative research. The learning issue was activated through the collective analysis of two videotaped real narratives (http://elearning.medicina.unina.it/webpon/Storie_Vere/Storie_Vere.htm).

For the final examination the students were assigned the task of conducting a non directive interview of a non hospitalised patient freely selected from among their acquaintances. They were also assigned the task of finding one or more scientific, statistics-based papers relating to the main content of the narrative.

The illness narratives were audio-taped by the students and transcribed following a set of explicit typographical rules. The transcripts were downloaded onto MEANINGS. This is a web-based application that embeds e-CNA (e-Collaborative Narrative Analysis), which is a set of interrelated web-based tools for the creation and analysis of a repository of illness narratives. Several dedicated analytical tools were developed and implemented. In particular, according to content analysis, each narrative was segmented into a sequence of Meaning Units which were in turn organised as a network of interacting themes by means of relational analysis (11).

A shared interpretation schema of the narratives made it possible to conceptualise them as ontologies which were displayed as semantic networks by means of the offline software Dynamic Knowledge Networks (DKN) (12, 13).

Results

Using the various tools provided by MEANINGS (forum, email, segmentation, codification, and so on), the participants were able to revise each transcript collaboratively several times until a shared analysis of the narrative was achieved.

The students were organised in groups of four to five and were assigned the task of sharing and discussing their respective narratives and the relative scientific papers, and writing a collective report.

The level of participation in the web-based activities was very high: almost 26,000 contacts in three months. It was also found that involving the students in the

process of gathering information about a patient's illness narrative generated a huge amount of data. So, web-based applications, such as MEANINGS, can provide, at the same time, a means for learning and a set of tools for the collaborative analysis of a repository of illness narratives. This could allow the linking of narratives with the results of statistical studies. The initial data set was composed of 247 illness narratives. The experiment was repeated, with minor modifications, in other university courses, such as nursing and in collaboration with some family doctors. The repository currently contains almost five hundred illness narratives, and is being analysed statistically in order to gain some insight into the similarities and differences between narratives. This could, hopefully, make it possible to compare the results of qualitative analyses with those of systematic reviews.

To this end, a multiprofessional team was set up. The team was initially composed of the physicians taking part in the interactive seminars. However, the team grew and continues to grow as other professionals have joined the initial group, i.e. family doctors, specialist doctors, general nurses, paediatric nurses, psychologists, pedagogues, philosophers, biologists, mathematicians, informaticians, bioethicists, statisticians, and a group of motivated students. Both the students and the professionals were allowed to access the repository of narratives and to analyse them by means of e-CNA, whose "ONTOLOGY" module allows illness narratives to be represented as ontologies. An ontology is a shared and explicit conceptualisation of the relevant concepts of a given phenomenon and of their relations, and it provides a language for talking about a given domain (14).

In particular, each narrative was represented as a sequence of episodes. Each episode was conceived of as triggered by an event leading to an emotional/cognitive response and to the activation of a set of social resources within the patient's social network. This activation leads to a set of decisions and actions that are mediated by several factors, e.g. cultural level, popular, religious, philosophical, political beliefs, and so on. The (provisional) outcome of each episode provides a description of the efficacy of the treatments and/or the diagnostic practices for the particular patient at a given point on the illness trajectory (Figure 1).
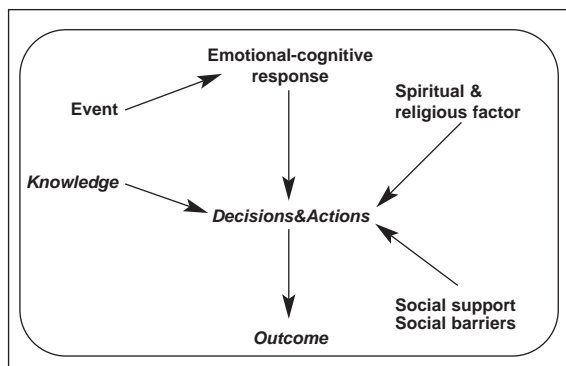
Figure 1. Episode from an illness narrative as a dynamic network of entities.

Relational analysis allowed each narrative to be represented as a directed graph in a common semantic space. In this way, the analysis of similarities and differences can be, in principle, carried out.

Figure 2 shows such a graph, representing the narrative of a woman affected by type 1 diabetes.

The analysis of the structural equivalence (15) between the nodes led to the definition of six components. Starting from the bottom left and going anticlockwise one can see the following components: the

onset of the disease, the initial non compliance with the therapy and the shrinking of the social relations, a serious complication due to non compliance, the onset of a cluster of unexplained "hysterical crises", a set of events related to pregnancy and abortion, the feeling of hopelessness due to the development of overwhelming complications despite the patient's strict compliance with the therapy and diet.

Discussion

Some authors claim that narrative-centred environments and curricula (16) could provide intriguing worlds in which students can become involved in story-centred problem-solving activities. The main idea is that narrative experiences are powerful environments for the stimulation of intrinsic motivation, and effective learning. In science education narratives could involve students in an inquiry and learning setting based on the highly non linear process of scientific discovery.

Narrative-based learning environments also make it possible to overcome the classical transmissive
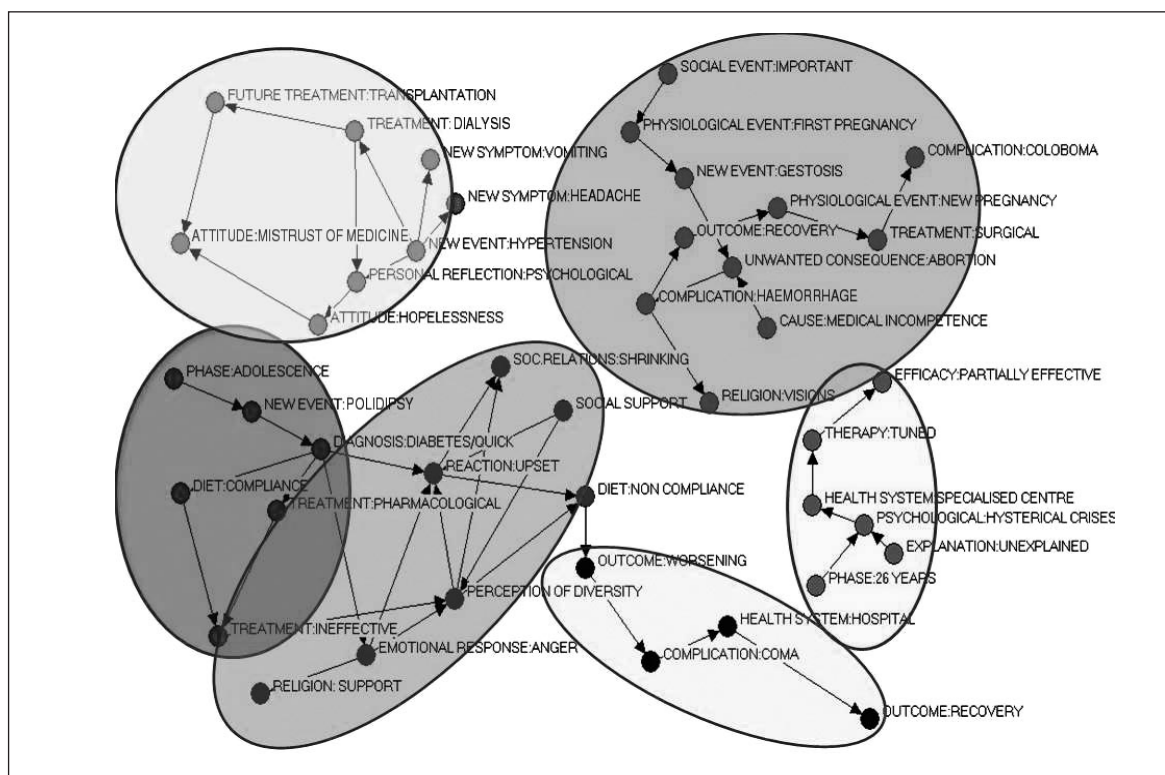

Figure 2. Representation of the illness narrative of a woman affected by type 1 diabetes.

teaching/learning models (TMs) which are essentially based on frontal lessons plus some practical exercises. The main assumption underlying TMs is that knowledge is supplied by an authoritative source, and the student's task is merely to acquire this knowledge and to reproduce it by answering questions during examinations. TMs are centred on the concept of teaching programmes, i.e. sequences of predetermined topics to be taught step by step.

Instead, the constructivist approach (17, 18) sees learning as an activity of knowledge construction in real or real-like contexts. This approach is usually based on small collaborative groups forming a learning community within which different and maybe conflicting points of view can be dialectically integrated. The supporters of this approach claim that collaborative learning facilitates a deeper understanding of the topics, durable learning, an inclination for self-directed learning, complex problem-solving strategies, the development of relational and metacognitive capacities, and so on. Situated learning (19) is a particular constructivist collaborative approach in which learners are involved in a real situation that is very close to their future professional environment. In fact, making content relevant and meaningful to a learner is a well-established means of enhancing learning.

The advocates of this approach argue that there is a need for a re-thinking of traditional approaches and a shift from teaching to coaching.

In this framework, the abstract nature of statistical concepts and reasoning is far removed from the vividness of the real-life situations in which practitioners are involved, and usually leads to emotion-free educational environments. On the other hand, it is well known that there is a close relationship between emotion and learning because emotions motivate students, reinforce meaningful learning, help them to retain information and avoid negative feelings (20-22).

In this respect illness narratives convey strong emotional feelings that can be used to generate meaningful and lasting learning of statistical concepts. In fact, the interaction with a suffering person is emotionally charged, and is the essence of health care. So, illness narratives can be powerful motivating factors in learning statistics because they draw students into a meaningful situated learning context that can

trigger appropriate generalisations and abstractions. Web-based narrative environments can be envisaged as tools for the generation of collaborative learning networks aimed at integrating different points of view and at creating knowledge in an interactive way. According to this pedagogical paradigm, students and tutors are co-constructors of knowledge.

It is worth emphasising that narrative reasoning is the normal way of thinking of human beings, and probably many barriers to learning and understanding statistics are due to the difficulty shifting from narrative thinking to formal thinking, and vice versa. By way of an example, Table 1 compares propositions expressed, respectively, in formal and narrative language.

Table 1. Comparison of formal and narrative statements.

Formal statement	Narrative statement
$2 + 2 = 4$	If you have two marbles and get two more marbles, then you've got four marbles.
$P(X=x_i) = 1/N$	If you throw a fair dice, then in the long run you will get "1" with a frequency 1/6, "2" with frequency 1/6, and so on.

It is well known that in the attempt to teach an abstract mathematical/statistical concept a formula is usually rendered as a narrative. Computer simulations and visualisations, too, are narratives. When a static, formal, symbolic and meaningless structure, 'devoid of time and person', is placed in a specific context it becomes a sequence of events happening to an experiencing person. The concrete meaning of a phenomenon is its narrative. Abstraction is the generalisation to a class of similar narratives, and formalisation is the transformation of the characteristics of classes of similar narratives into symbolic a-temporal relational structures or forms. A *formula* is literarily a *small form* composed of elements connected by relations (e.g. "=", "+", "/", and so on).

Most of the examples used in teaching statistics deal with the transformation of narrative statements into formal statements, and vice versa. Many students are

unable to switch easily from concrete narratives to abstract generalisations, and from generalisations to formal relational statements. This continuous interplay between narrative reasoning and formal reasoning can be seen as the very essence of teaching and learning statistics.

These considerations can be extended to more complex narratives, such as illness narratives.

In our model, each episode was conceptualised as a network of "entities" (the nodes of the network) connected by a set of possible relations (Fig. 2). This ontology allows each narrative to be represented in a common semantic space. So, in principle, a sample of illness narratives can be explored in order to find similarities or dissimilarities between illness trajectories. This conceptualisation stemmed from the vis-à-vis and web-based interactions among the participants, and it is still evolving beyond the end of the university courses. In this way, the students can be conceived of as co-producers of knowledge rather than merely as receivers of notions coming from an authoritative source. This agrees with the modern constructivist model of learning/teaching.

Evaluating the success of the blended narrative e-learning model is not straightforward because there are no traditions in this field, and the evaluation of social dynamics sometimes involving strong emotions is a very complex issue. Traditional summative scores are not able to grasp this complexity. We are still trying to develop suitable assessment methodologies. The main direction of this research is towards the use of mixed quantitative/qualitative methods. In particular, we are developing an innovative model aimed at assessing not only what the students know (summative assessment), but also how they know what they know (formative assessment), and their role in the social construction of knowledge within the group.

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