

Medical Staff Attitudes Towards Patients in Acute Pain: An Application of Categorical Principal Component Analysis

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Abstract Pain is a symptom often associated with disease, but it could be considered a disease per se. Several studies indicate that hospital pain treatment is seldom adequate. Within the project “Towards a Pain-free Hospital”, this paper analyze attitudes and knowledge of doctors and nurses on the wards of 9 hospital centres run by ASL Napoli 1. The survey has been conducted through a questionnaire aiming to evaluate the following dimensions: attention paid to pain, the use of analgesic drugs; pain in children; relational needs; addiction and prejudice. 781 healthcare professionals have been interviewed (264 doctors and 517 nurses). The results show different behaviours towards patients in pain. Precisely, while some healthcare professionals are empathic and are able to listen to patients’ needs and sensations, others have an attitude which is influenced by their own opinions about the use of analgesics and the possible onset of addictions. Hence, in the examined context, there are significant deficit and wrong beliefs, that represent an obstacle to an “adequate” treatment of patients in pain.

Key words: Health service research, Categorical Principal Component Analysis, Pain-free hospital, Pain knowledge, Pain attitudes.

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1 Introduction

This study on medical staff knowledge and attitudes towards pain treatment was conducted in the framework of the implementation of a directive from the Italian Prime Minister, regarding the guidelines to realise the “Towards a Pain-free Hospital” project, issued by the Italian Health Ministry (G.U. n.149, 29/06/2001). The ministerial guidelines reflect the debate on pain treatment, started in the nineties with the implementation of innovative projects at St.Luc Hospital, Canada, in 1992, and in several european and american countries in the following years.

Almost ten years after the guidelines were issued, the Italian scenario shows a patchy situation, where centres of excellence coexist with backwardness situations, mainly in the southern regions. While rules and guidelines were enacted in every region, the actual implementation in many hospitals is still poor.

In order to implement the “Towards a Pain-free Hospital” project, a theoretical perspective is needed to understand the problem as a whole (Montali *et al.*, 2009) and recognise that health workers consider suffering an unavoidable but obscure psychological experience (Whelan, 2003); then, medical staff attitudes cannot be underevaluated in the realization of pain-free hospitals.

According to Cantril (1932), “an attitude is a more or less permanently enduring state of readiness of mental organization which predisposes an individual to react in a characteristic way to any object or situation with which it is related”. Then, an attitude is a tendency, or an enduring disposition, to react positively or negatively to a specific object or category of objects (Oskamp, 1977). This implies that attitudes are among the principal determinants of actions and behaviours, and an important study topic.

Given these preliminary remarks, aim of this study is to investigate those aspects which can hinder the complete application of rules and directions already shared on the enunciative level. In particular, attention is given to obstacles that remain unsaid, because they pertain to cultural and professional attitudes toward suffering, with psychological and emotional implications which influence the relationship between health workers and patients.

Before entering in further detail, it is necessary to define what is meant with the term “pain”, and what kind of pain is considered in the present research. The study adopts the International Association for the Study of Pain (IASP) definition of pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (IASP, 1979). Then, pain is always an unpleasant subjective experience with a somatic component that generates an emotional charge; in this sense, pain is a subjective psychological status.

Pain can be classified in “acute” and “chronic” according to the interval of time from onset. This study is focused on medical staff attitudes towards treatment of post-surgical acute pain. Acute pain is due to a tissue damage, with a corollary of reactions depending on the individual who suffered the injury or the trauma.

Acute pain is also a multidimensional phenomenon, originated by the interaction of biological, psychological and environmental factors (Melzack, 1973). Limited knowledge and wrong attitudes toward pain treatment imply that pain is often not adequately treated because health operators undervalue or do not recognise it (De Martino *et al.*, 2005), despite pain was proved to be physically, socially and psychologically disabling (Besner and Rapin, 1993). Although pain can be controlled in about 90% of the cases (WHO, 1996), the rate of hospitalised patient reporting pain

ranges from 43% to 79% (Donovan *et al.*, 1987; Abbott *et al.*, 1992; Trentin *et al.*, 2001), which testifies problems of the medical staff with pain treatment.

In this paper we present some results from a survey conducted on hospital staff about knowledge and attitudes towards the treatment of patients suffering for post-surgical acute pain (Section 3). Furthermore, in Section 4 we analyze the multivariate structure of attitudes through Categorical Principal Component Analysis (CATPCA).

2 Survey structure

The survey was carried out in 2008 by the Humanisation Service of the Local Health Unit ASL NA 1 (Naples city), in order to conform behaviours and medical practices to national rules and regional directives aiming at defining pain treatment as a part of the therapy.

The survey instrument is a closed-ended questionnaire with questions pertaining medical staff attitudes, knowledge and opinions about patients in pain. Question items were chosen under the guidance of previous studies, namely Lebovits *et al.* (1997) and Visentin *et al.* (2001). Lebovits's survey was conducted in three hospitals of New York, and consisted in 17 items collected in various medical papers (Sheehan *et al.*, 1992; Ferrell *et al.*, 1993; Brunier *et al.*, 1995), while Visentin's survey was carried out at the San Bortolo Hospital of Vicenza (Italy) and consists of 16 items, 11 of which are taken from Lebovits's survey. The questionnaire used for the present study includes 24 items: 15 were borrowed from Lebovits *et al.* (1997), 4 from Visentin *et al.* (2001), and 5 were worded by the authors in order to cover new research interests (items 20 to 24). The 24 items can be grouped in five thematic areas:

- a) Attention paid to pain (items 6 and 12-15): these items concern the centrality of patients in the assessment of pain intensity, their rights and their expectations on pain-relief;
- b) Use of analgesics (items 1-5 and 11): this area investigates the knowledge about administration of pain relievers and its consequences;
- c) Children's pain (items 8-10): items regarding pain treatment in pediatric patients;
- d) Relational needs (items 16, 21 and 23): these items investigate the existence of a supportive and intimate attitude towards patients, based on a positive and caring relationship;
- e) Addiction and prejudice (items 17-20, 22 and 24): this area regards drugs addiction concerns and prejudiced attitudes towards the real pain intensity as risk factors for a scarce assumption of responsibility for pain problems.

Item responses are measured through a 4-point agreement scale ("Totally agree", "Agree", "Disagree", "Totally disagree"). The questionnaire also investigates some personal and professional characteristics, e.g. gender, age, professional role, ward, hospital. A first draft of the questionnaire was pre-tested before wording the final version. The anonymous questionnaire was administered by trained interviewers.

The survey population consists of physicians and nurses employed in the various hospitals of the Local Health Unit ASL NA 1. Sample size was fixed to about 800 units, in order to achieve a maximum error of 4% in the hypothesis of maximum

variance with a 98% confidence level. Sample design was a proportional stratified sampling with professional role, hospital and ward as stratification variables.

The caregivers interviewed were 781; 62.8% are males, and the average age is about 48. Nurses are the majority (66.2% vs. 33.8% of physicians); 44.4% of the sample work in a surgical ward, 33.3% in a medicine ward, 15.9% in the intensive care unit and 6.4% in other wards (Emergency etc.).

3 Knowledge and attitudes of the medical staff

The study had a double purpose: the assessment of the level of knowledge about pain treatment practices, and the detection of common patterns in the attitudes towards patients in pain.

As in previous studies (Visentin *et al.*, 2001; Lebovitz *et al.*, 1997; Brunier *et al.*, 1995; Ferrell *et al.*, 1993), the percentage of correct answers was computed for each item on the basis of the consistency between item responses and pain therapy practices commonly recognised by the international medical community, in order to assess knowledge and practices of the medical staff.

An overall number of 781 healthcare professionals has been interviewed (264 doctors and 517 nurses). Table 1 shows the percentage of correct answers for each question. The question that had the highest percentage of correct answers (94,3%) was No. 13 ("For effective treatment of cancer pain, it is necessary to continuously assess the pain and the efficacy of the therapy;" correct answer: "I agree"). The question with the lowest number of correct answers (30%) was No. 12 ("It may often be useful to give a placebo to a patient in pain to assess if he is genuinely in pain;" correct answer: "I disagree"). Our aim is to bring to light the positive attitudes detected, without hiding the critical ones in order to obtain a better service to patients and an "adequate" treatment of pain. In underlining data with positive aspects, we find useful to highlight some problems and perplexities. For instance, within the area "the use of analgesic drugs" 25% of the sample expresses opinions indicating a low knowledge about the use of analgesics. Moreover, in the area "addiction and prejudice" more than a half of the medical staff (and for some items up to 65%) shows to be preoccupied about the fact that patients can become addicted to the drugs. This aspect could be reinforced by the data regarding the 2/3 of the sample which retains that the patients emphasize the pain and that for this reason it could be useful to give them a placebo in order to evaluate if the pain is real. On the other hand 71.4% of the medical staff agrees with item 6 "The most accurate judge of the intensity of the patient's pain is the patient" and 72.2% of the sample thinks that the patients have the right to expect a total pain relief as a consequence of the treatment. Regarding the area "relational needs", 83% of the medical staff is convinced that an attitude of closeness toward the patients can help hold the pain. About the 3/4 of the sample is aware of the importance of distraction for decreasing the perception of pain in the patient, for example by the use of music or relaxation techniques. Low percentage of correct answers are present in the thematic area "Children's pain", but this aspect can depend on the fact that none of the 9 hospitals where the interviewed medical staff operate, is indeed a paediatric centre.

Table 1 – Percentage of Correct Answers for each item

<i>Item of the thematic area: "Attention paid to pain"</i>	<i>Percent Correct Answer</i>
6) The most accurate judge of the intensity of the patient's pain is the patient. (Y)	71,4
12) It may often be useful to give a placebo to patients in pain to assess if he is really in pain. (N)	30,0
13) For effective treatment of cancer pain, it is necessary to continuously assess the pain and the efficacy of the therapy. (Y)	94,3
14) It is a patient's right to expect total pain relief as a consequence of treatment. (Y)	72,2
15) Lack of pain expression does not mean lack of pain. (Y)	84,5
<i>Item of the thematic area: "Use of analgesics"</i>	
1) Giving narcotics on a regular schedule is preferred over prn schedule for continuous pain. (Y)	74,9
2) A patient should experience discomfort prior to giving the next dose of pain meds. (N)	53,8
3) The preferred route of administration of narcotic pain relievers to patients with cancer-related pain is intramuscular. (N)	71,7
4) When a patient requests increasing amounts of analgesics to control pain, this usually indicates that the patient is psychologically dependent. (N)	58,6
5) Patients receiving narcotics on a prn basis may be likely to develop clock-watching behaviors. (Y)	49,1
7) When a patient in pain is receiving analgesic medication on a prn basis, it is appropriate for the patient to request pain meds before the pain returns. (Y)	47,1
11) The most suitable dose of morphine for a patient in pain is a dose which best controls the symptoms; there is no maximum dose (ie. a level which must not be exceeded) for morphine. (Y)	51,4
<i>Item of the thematic area: "Children's pain"</i>	
8) Staff can always pick up cues from children that indicate that they are in pain. (N)	62,4
9) Narcotics can cause respiratory depression, so they should not be used in paediatric patients. (N)	47,9
10) Children often cry; so, diversional activities are indicated rather than actual pain meds. (N)	44,1
<i>Item of the thematic area: "Relational needs"</i>	
16) Distraction for example by the use of music or relaxation techniques can decrease the perception of pain. (Y)	74,8
21) A greater closeness from the operator can be helpful to increase the pain threshold. (Y)	83,0
23) A long conversation helps the patient to sustain pain. (Y)	64,1
<i>Item of the thematic area: "Addiction and prejudice"</i>	
17) Increasing analgesics requirements are sign that the patient is becoming addicted to drugs. (N)	35,4
18) If a patient, or family member, reports that a narcotic s causing euphoria, she/he should be given a lower dose of the analgesic. (N)	49,1
19) 25% of patients receiving analgesics around the clock become addicted. (N)	47,8
20) Patients often exaggerate when reporting their pain, even when it is just a normal pain. (N)	34,3
22) It is appropriate to help the patient to handle normal pain avoiding, in this way, to give him/her drugs. (N)	35,1
24) It is appropriate to push the patient to learn living with the pain in order to stop continuous narcotics requests. (N)	55,2

(Y) = The correct answer is yes. – (N) = The correct answer is no.

4 Latent structure of attitudes through CATPCA

Aiming at detecting different patterns of behaviour in pain treatment, and given that the collected variables are measured on an ordinal scale we perform a Categorical Principal Component Analysis (CATPCA). Indeed, for our scale we cannot assume *a priori* that the distances between the categories are equal. In analyzing ordinal variables it should be taken into account that the categories of the variable have a fixed *a priori* order, but this does not imply that the differences between numeric labels of the categories are maintained.

As known, in the behavioural sciences many variables are nominal or ordinal and relationships between variables are frequently nonlinear. Hence, linear or standard PCA could be not appropriate and should be used only after linearity in ordinal

variables has been verified. During the last years, nonlinear PCA has been introduced and developed to avoid the limitations of standard PCA (Gifi, 1990; Linting *et al.*, 2007).

The CATPCA procedure (Meulman *et al.*, 2004) belongs to such class of methods, and it is based on quantification of categorical variables by applying optimal scaling technique. The CATPCA finds category quantifications that are optimal in the sense that the overall variance accounted for in the transformed variables, given the number of components, is maximized. In the optimal scaling process, information in the original categorical data is retained in the optimal quantifications, depending upon the optimal scaling level that can be chosen for each variable separately (Meulman *et al.*, 2004).

Nonlinear transformations of categorical variables can be nonmonotonic and monotonic. Usually, monotonic transformations are suited for ordered categorical or continuous data, while nonmonotonic functions are used to transform nominal data. Actually, nonmonotonic transformations can also be used for numeric and ordinal variables when nonlinear relationships among variables could be present in the data (Meulman *et al.*, 2004).

Hence, CATPCA is the nonlinear equivalent of PCA and aims at the same goals of traditional PCA, but it is suited for variables of mixed measurement level that may not be linearly related to each other (Linting *et al.*, 2007). Therefore, all the mathematical properties of PCA are held in CATPCA. Moreover, CATPCA takes simultaneously into account the nature of items, the different role of items in determining the measure, and the possible multidimensionality of the concept.

For the above discussion, CATPCA is particularly suitable for our goals and dimension reduction problem with ordinal variables. We applied it on 21 items, belonging to four out of the five thematic areas described¹. For items reporting a wrong practice (according to the commonly recognised international medical community) the scale has been reversed in order to make all the item scales comparable.

The CATPCA procedure produced a bi-dimensional solution, which explains 29.2% of the variance; the Cronbach Alpha value indicates a reliability level of 0.879.

Alternative solutions with a larger number of dimensions have been explored, but the gain in term of explained variance was poor. Indeed, we explored also the three and four dimension solutions that explain respectively 35.8% and 42.6% of the variance. Such solutions mainly confirmed the bi-dimensional results and for this reason we preferred to present this latter.

The quantification analysis shows a monotonic trend that confirm the ordinal nature of the original scale. Quantifications show some scale points could be merged for some items. Specifically, in this analysis, scale points were merged for items 1, 6, 11, 12 and 14. Moreover, the items 2, 3, 5, 13 and 17 show nonlinear monotonic behaviour.

The first dimension explains 16.8% of variance, and the items which saturate this factor show an internal consistency level of 0.751 (Cronbach Alpha), that we call “relational attitude and belief. The second dimension, related to “technical knowledge”, explains 12.4% of the variance, and the saturating items internal consistency 0.648.

The graphical representation of factor loadings (Figure 1) highlights two groups of variables²: on the right end we can find most of the items belonging to the “Relational

¹ Children's pain was not considered, since the theme is excessively specific.

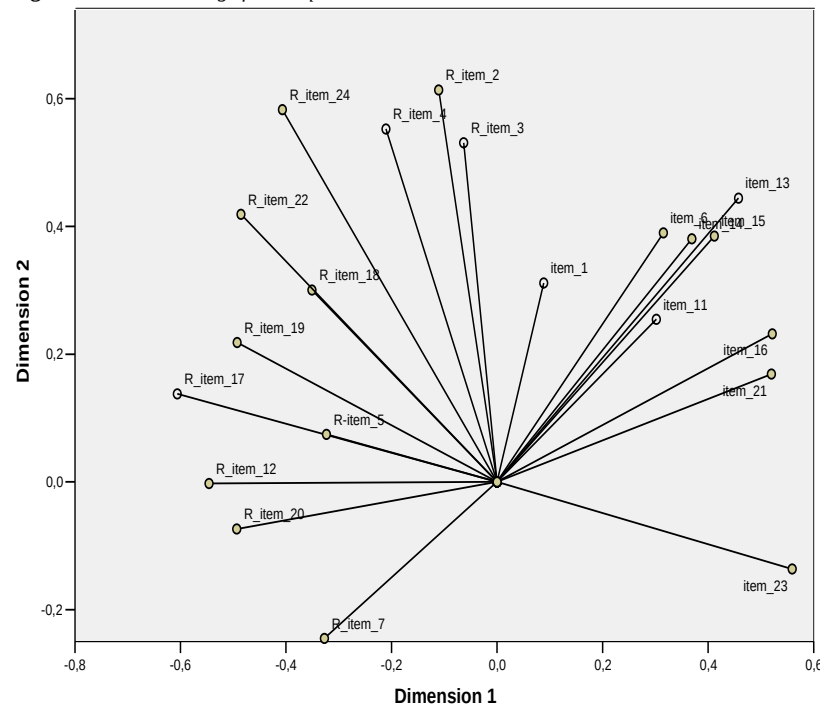
² In analogy with classical PCA, the vector length for each item indicates its fit with the obtained solution: short vectors indicate the item is not well represented in the solution, while long vectors

needs” area (items 16, 21 and 23) and to the “Attention paid to pain” area (items 6 and 13-15). This describes an attitude mainly oriented to the listening of patients, of their needs and sensations, and to an emotional closeness which leads to a pain therapy free from prejudice and well-disposed towards pain-free hospitals. The presence of item 11, about the possibility to administer morphine according to the patient’s need, without a maximum dose threshold, confirms the meaning of this dimension. On the left side of the plot we find items concerning the “Addiction and prejudice” area, and some items in the “Use of analgesics” area (items 5 and 7).

The co-presence of items belonging to two different areas is due to their closeness: items 5 and 7, belonging to the “use of analgesics” area, in fact measure a technical and scientific knowledge about drugs administration, which is strongly influenced by personal opinions on pain intensity and addiction risks. In particular, these items refer to the administration of analgesics “as needed”, and are worded in a way that foreshadows addiction and further analgesics requests.

The second dimension is characterised by technical and professional competencies about use of analgesics (items 1-4). In the upper side of the plot we can find medical staff with a correct knowledge on analgesics’ use, opposed to caregivers who gave wrong answers, represented in the lower side.

Figure 1: Factor loadings for the questionnaire items



correspond to well represented items. Orthogonality between groups of vectors indicate a lack of correlation, while close vectors correspond to correlated items.

References

1. Abbott F. V., Gray-Donald K., Sewitch M. J., Johnston C. C., Edgar L., Jeans M. E.: The prevalence of pain in hospitalized patients and its resolution over six months. *Pain*, **50**, 15--28 (1992)
2. Besner G., Rapin C. H.: The hospital creating a pain-free environment: a program to improve pain control in hospitalized patients. *J. Palliat. Care* **9**, 1. 51--52 (1993)
3. Brunier G., Carson M. G., Harrison D. E.: What do nurses know and believe about patients with pain? Results of a hospital survey. *J. Pain Symptom Manage.* **10**, 436--445 (1995)
4. Cantril A. H.: General and specific attitudes. *Psychological Monographs* **CXXII**, 250--267 (1932)
5. De Martino A., Nebbioso G., Petrella F., Migliorini E., Ferraro I., Maiorano C.: Valutazione degli atteggiamenti e delle conoscenze sul dolore da parte degli operatori sanitari impegnati nel trattamento delle lesioni croniche cutanee. *Helios* **I**, 8--14 (2005)
6. Donovan M., Dillon P., McGuire L.: Incidence and characteristics of pain in a sample of medical surgical inpatients. *Pain* **30**, 69--78 (1987)
7. Ferrell B. R., McGuire D. B., Donovan M. L.: Knowledge and beliefs regarding pain in a sample of nursing faculty. *J. Prof. Nurs.* **9**, 79--88 (1993)
8. Gifi A.: *Nonlinear Multivariate Analysis*. J. Wiley, New York (1990)
9. International Association for the Study of Pain: Pain terms: a list with definitions and notes on usage. *Pain* **6**, 249--252 (1979)
10. Lebovits A.H., Florence I., Bathina R., Hunko V., Fox M., Bramble C.: Pain Knowledge and Attitudes of Healthcare Providers: Practice Characteristics Differences. *Clin. J. Pain* **13**, 237--243 (1997)
11. Linee Guida per la Realizzazione per un Ospedale senza Dolore del 24.05.2001, G. U. Repubblica Italiana del 29.06.2001, S. G. **149** (2001)
12. Linting, M., Meulman, J. J., Groenen, P. J. F., Van der Kooij, A. J.: Nonlinear principal components analysis: Introduction and application. *Psychological methods*. **12**, 3. 336--358 (2007)
13. Melzack R.: *The puzzle of pain*. Penguin, London (1973). (trad. it. : *L'enigma del dolore: aspetti sociologici, clinici e fisiologici*. Zanichelli, Bologna 1976).
14. Meulman J. J., Kooij A. J. Van Der, Heiser W.: Principal Component Analysis with Nonlinear Optimal Scaling Transformations for Ordinal and Nominal Data. In: Kaplan D. (eds.) *The sage Handbook of Quantitative Methodology for the Social Science*. Sage, London (2004)
15. Montali L., Colombo M., Riva P.: Teorie e pratiche nella gestione del dolore: una ricerca sulle rappresentazioni dei medici. *Psicologia della Salute* **1**, 33--56 (2009)
16. Oskamp S.: *Attitudes and Opinions*. Prentice Hall, Englewood Cliffs (1977)
17. Sheehan D. K., Webb A., Bower D., Einsporn R.: Level of cancer pain knowledge among baccalaureate student nurses. *J. Pain Symptom Manage.* **7**, 478--484 (1992)
18. Trentin L., Visentin M., de Marco R., Zanolin E.: Prevalence of pain in a public Hospital: correlation between patients and caregivers. *J. Headache Pain* **2**, 73--78 (2001)
19. Visentin M., Trentin L., de Marco R., Zanolin E.: Knowledge and Attitudes of Italian Medical Staff Towards the Approach and Treatment of Patients in Pain. *J. Pain Symptom Manage.* **22**, 5. 925--930 (2001)
20. Whelan E.: Putting pain to paper: endometriosis and the documentation of suffering. *Health: An Interdisciplinary Journal for the Social Study of Health, Illn. Med.* **7**, 4. 463--482 (2003)
21. World Health Organization: *Cancer pain relief with a guide to opioid availability*, (2nd ed.) World Health Organization, Geneva (1996)