PAIN® 147 (2009) 20–28

PAIN®

www.elsevier.com/locate/pain

Research papers

Multidisciplinary pain management based on a computerized clinical decision support system in cancer pain patients

Thilo Bertsche [a,b], Vasileios Askoxylakis [c], Gregor Habl [c], Friederike Laidig [b], Jens Kaltschmidt [a], Simon P.W. Schmitt [a], Hamid Ghaderi [d], Angelika Zabel-du Bois [c], Stefanie Milker-Zabel [c], Jürgen Debus [c], Hubert J. Bardenheuer [d], Walter E. Haefeli [a,*]

[a] Department of Internal Medicine VI, Clinical Pharmacology and Pharmacoepidemiology, University of Heidelberg, Im Neuenheimer Feld 410, 69120 Heidelberg, Germany
[b] Cooperation Unit Clinical Pharmacy, University of Heidelberg, Germany
[c] Department of Radiation Oncology, University of Heidelberg, Germany
[d] Department of Anaesthesiology, University of Heidelberg, Germany

ARTICLE INFO

Article history:
Received 15 December 2008
Received in revised form 6 July 2009
Accepted 13 July 2009

Keywords:
Analgesia
Pain measurement
Pharmacists
Decision support systems, Clinical
Pain clinics
Patient care team
Neoplasms

ABSTRACT

A prospective controlled intervention cohort study in cancer pain patients ($n = 50$ per group) admitted to radiation oncology wards (62 beds, 3 wards) was conducted in a 1621-bed university hospital. We investigated the effect of an intervention consisting of daily pain assessment using the numeric visual analog scale (NVAS) and pain therapy counseling to clinicians based on a computerized clinical decision support system (CDSS) to correct deviations from pain therapy guidelines. Effects on guideline adherence (primary outcome), pain relief (NVAS) at rest and during physical activity (both groups: cross-sectional assessment on day 5; intervention group: every day assessment), co-analgesic prescription, and acceptance rates of recommendations (secondary outcomes) were assessed. The number of patients with at least one deviation from guidelines at discharge was decreased by the intervention from 37 (74%) in controls to 7 (14%, $p < 0.001$). In the intervention group, pain (NVAS) decreased during hospital stay at rest from 3.0 ($\Delta_{0.5}$ ($Q_{75\%} - Q_{25\%}$) = 3.0) on admission to 1.5 ($\Delta_{0.5} = 1.0$) at discharge ($p < 0.01$) and during physical activity from 7.0 ($\Delta_{0.5} = 4.0$) on admission to 2.5 ($\Delta_{0.5} = 3.8$) at discharge ($p < 0.001$). At discharge, the number of patients treated with co-analgesics increased from 23 (46%) in controls to 33 (66%) in the intervention group ($p = 0.04$). From 279 recommendations issued in the intervention 85% were fully accepted by the physicians. Deviations from well-established guidelines are frequent in pain therapy. A multidisciplinary pain management increased adherence to pain management guidelines.

1. Introduction

Pain is often the main factor limiting the quality of life in cancer patients. Depending on tumor stage and location the prevalence of cancer pain can range from 52% to 81% [4,11,24,57]. Indeed, particularly severe pain is a burden for many patients and consequent pain reduction is therefore indispensable [58]. The individual pain situation may vary considerably but approximately 90% of the patients experience pain more than 25% of the time [47]. Hence, to relieve pain and tailor individual treatment regimens most efficiently, severity, duration, and fluctuation of cancer pain have to be characterized by a regular assessment for every patient. Today, comprehensive guidelines for the treatment of these patients are available [41,42] and when they are strictly followed tumor-induced pain can be effectively treated in an estimated 90% of all cancer patients [45]. Despite all these options, about 30% of the patients who need pain relief are not offered any medical treatment and the number of patients with inadequate therapy varies between 42% and 75%. Unfortunately, this situation has not been pivotally changed for decades [5,11,34,43].

Analgesic underuse is a frequent consequence of flaws in pain detection. Indeed, patients often do not ask for further medication as pain becomes worse. Conversely, physicians or nurses do not regularly query the patient for pain. Another reason for insufficient prescription of (co-)analgesics is the low adherence to the principles and recommendations of pain guidelines [56], leading to significant differences among physicians in the management of cancer pain [43]. Computerized physician order entry (CPOE) coupled to clinical decision support systems (CDSS) has successfully enhanced adherence to guidelines, helped avoid medication errors, reduced costs, and improved treatment response [2,3,16,48,49]. For pain therapy in cancer patients, however, very limited data are available about the effects of such systems [15,25,27]. In the

* Corresponding author. Tel.: +49 6221 56 8740; fax: +49 6221 56 4642.
E-mail address: walter.emil.haefeli@med.uni-heidelberg.de (W.E. Haefeli).

0304-3959/$36.00
doi:10.1016/j.pain.2009.07.009

past, computerized systems often lacked proper integration into daily routine and failed to reach positive outcomes at the patient level [20].

Today, a substantial body of evidence is available about the practice of chronic pain assessment [18]. Controlled trials, however, investigating concepts that combine pain assessment with evidence-based therapeutic recommendations are scarce [39,54]. We, therefore, aimed to evaluate the impact of an overall concept concurrently assessing pain and suggesting treatment or treatment modifications for patients suffering from chronic cancer pain. To standardize the intervention, the management was based on a newly developed CDSS and aimed at improving adherence to guidelines.

2. Patients and methods

2.1. Patients

After approval of the study protocol by the Ethics Committee of the Medical Faculty of the University of Heidelberg consecutive patients fulfilling the following inclusion criteria were enrolled after written informed consent was obtained. Patients with treated or untreated cancer pain who were admitted to one of three radiation oncology wards (62 beds in total) of a 1621-bed university hospital were invited to participate. For inclusion, they had to be 18 years or older and able to communicate adequately (no physical and mental restrictions, sufficient language skills). Previous or ongoing analgesic therapy was allowed except patient controlled analgesia (PCA) via infusion pumps because these patients were managed directly by experts of the hospital's center for pain medicine.

2.2. Computerized clinical decision support system (CDSS)

An expert panel consisting of palliative care anesthesiologists, pharmacists, experts in medical informatics, and clinical pharmacologists developed a new CDSS in an eight-step procedure: (i) An algorithm for cancer pain therapy was developed by a senior pharmacist to cover up-to-date pain therapy. The algorithm followed the guideline of pain management of the Drug Commission of the German Medical Association which is based on the well-known three-step WHO guideline including also the detailed suggestions for the treatment such as the use of co-analgesics and supportive medicines [28,30,37,42,55]. Additionally, recommendations were given when to refer to the local pain center. It also included pertinent information from product information sheets (drug label) of the pharmaceutical companies approved by the legal authorities [13]. (ii) The algorithm was evaluated for appropriateness by a senior anesthesiologist specialized in palliative care. (iii) Potential inconsistencies were discussed in three meetings and a revised version was developed. (iv) The algorithm was then transferred into a CDSS. (v) The system was evaluated in the center for pain management during regular patient consultations by physicians specialized in pain therapy (pilot study). (vi) Modifications were discussed with the users and the head of the center and integrated into the system if appropriate. (vii) The system was verified by a senior clinical pharmacologist for pharmacological accuracy of its content with a particular focus on dosage recommendations for specific patient groups. (viii) After conducting final modifications in the system this version was activated for the main study. The CDSS and the general structure of the underlying algorithm are shown in Figs. 1 and 2.

The final system was based on the WHO principles for good pain therapy (e.g. "by the mouth, by the clock, by the ladder") adjusted to typical clinical pain situations in an algorithm for practical use. Additionally, this algorithm included treatment recommendations if the use of the WHO-ladder analgesics alone was limited, e.g. for specific pain localizations (e.g. bones, liver) or when co-analgesics should be recommended (neuropathic pain). Moreover, the electronic system gave advice to contact the pain center in specific therapeutic situations if the standard regimen was not appropriate; for instance if patient controlled analgesia (PCA) was required. The CDSS was integrated into the hospital's widely used drug information system that contained up-to-date information about the drugs of the local hospital formulary and the whole German market for ambulatory care.

2.3. Evaluation of guideline adherence

Deviations from the following principles of good pain therapy according to international and national guidelines [28,30,37,42,55] or the legal requirements of the drug label [13] were defined as "guideline deviation" and were investigated within this study. Off-label use regarding the therapeutic indication was not considered as deviation if the substance in general was recommended by guidelines or was seen as appropriate in the literature.

(1) Missing non-opioid in patients on opioid therapy.
(2) Non-opioid only on demand in patients on opioid therapy.
(3) Inappropriate non-opioid combination (combination of two NSAIDs).
(4) Inappropriate opioid combination (e.g. morphine with buprenorphine).
(5) Missing opioid with long-acting formulation for around-the-clock dosing (in patients prescribed an opioid p.r.n.).
(6) Missing rescue opioid (in patients on long-acting opioids).
(7) Missing oral or transdermal administration (in patients suitable for respective route of administration).
(8) Inappropriate dosage interval or timing of drug administration (e.g. q.d. prescription of a co-analgesic requiring b.i.d. administration according to the drug label).
(9) Inappropriate medication (e.g. contraindicated for the individual patient).
(10) Inappropriate galenic formulation (e.g. immediate-release formulations for long-acting pain relief).

In the intervention group a number of additional criteria were assessable that were not assessable in the control group without daily feedback (e.g. newly occurring side effects requiring additional therapy):

(1) Underdosing – analgesic dosage too low (according to pain assessment; the dosage was defined as too low when the patient suffered from pain with a NVAS score >2 at rest or >4 during physical activity. These limits were found suitable for routine use in the pilot study. Additionally, patient characteristics such as tumor progression, type and localization, and individual perception were considered if a dosage was classified as underdosed).
(2) Overdosing – dosage too high (according to pain assessment; the dosage was defined as too high when the patient suffered from typical undesired adverse effects and NVAS was nearly "0").
(3) No opioids prescribed although required according to the individual pain situation (pain assessment with a NVAS score >2 at rest or >4 during physical activity). Also patient characteristics such as tumor progression, type and localization, and individual sensation were considered.
(4) Missing or inappropriate supportive drugs (e.g. laxatives and antiemetics).
(5) Missing or inappropriate co-analgesics (e.g. antidepressants, anticonvulsants, and glucocorticoids).