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## Multimodal Pain Therapy for Perioperative Pain

Angela F. Bischof

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Multimodal Pain Therapy for Perioperative Pain

by

Angela F. Bischof

Masters in Nursing, University of North Dakota, 2012

An Independent Study

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

For the degree of

Master of Science, Nurse Education

Grand Forks, North Dakota

October

2012

## PERMISSION

Title Multimodal Pain Therapy for Perioperative Pain

Department Nursing

Degree Master of Science

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### Abstract

Pain is an expected reaction from tissue injury in the postoperative setting, yet it is commonly inadequately managed. The literature has exposed some clear cut guidelines to manage acute pain, and the consequences poorly managed pain.

Pain management is expected to be individualized, timely, safe, evidence based and multimodal. An extensive literature review of the current research of multimodal pain management was conducted. Specifically; the use of opiates along with at least one non-opioid (Tylenol, NSAIDs, gabapentin and pregabalin).

The evidence illustrates the positive effects of multimodal pain management; better pain control and a decrease in the side effects of opioids.

At the conclusion of the project, a presentation on the findings and recommendations were shared with the community hospital in order to persuade a positive change toward evidence- based pain management.

### Introduction

Pain is a common and expected reaction from tissue injury in the postoperative setting. Despite the availability of modern medications and guidelines to manage pain, the incidence of postoperative pain has remained inadequately managed. According to a recent report from the Institute of Medicine “the magnitude of pain in the United States is astounding. More than 116 million Americans have pain that persists for weeks to years. The financial cost of this epidemic is \$560billion to \$635billion per year” (Pizzo & Clark, 2012, p. 197). Specific to the postoperative setting approximately 50% of the patients report uncontrolled postoperative pain (Polomano, Dunwoody, Krenzischek, & Rathmell, 2008). In addition to cost, patients with pain often occupy valuable space in emergency rooms. The most common reason for admission to the emergency department is pain (American Society for Pain Management Nursing, Emergency Nurses Association, American College of Emergency Physicians, & American Pain Society, 2010). In addition, pain is attributed as the most common cause for readmissions after same-day surgery (Polomano et al, 2008).

In the hospital setting excellent patient care and achieving patient satisfaction is a high priority. One of the areas we truly fall short in is effective pain management. Some providers do well by ordering opioids (another term for narcotics) of various forms along with options of a NSAID and/or an around the clock Tylenol. On the flip side some providers are frugal with the amount, type, and frequency of analgesics. Even limiting pain therapy to just one mode; an opioid alone which often results in inadequate pain control. An update on the most current practice in pain management is seriously needed. Multimodal pain management seems to be the wave of the future, it is recommended by numerous authors. Experts in the field of pain management like the American Pain Society and, The American Society of Anesthesiologist



recommend multimodal pain management. This will be discussed in further detail throughout the paper.

### **Purpose/Significance**

The purpose of this project is to provide a review of pertinent literature related to best practices in management of acute pain in the acute care setting. It will also touch of some helpful information regarding chronic pain. The inspiration to dig into this topic came about after attending a conference where Chris Pasero discussed pain management. She motivated further investigation into this topic. She touched on the utilization of multimodal pain therapy. The research has definitely supported the use of multimodal pain therapy. Now, more than ever the determination prevails to improve pain management in the acute care setting.

Multimodal pain therapy was found to be an exceptionally broad term. For the purpose of this project the term multimodal therapy was limited to the combination of two or more medications belonging to the following drugs categories/classifications: opiates along with at least one non-opioid (Tylenol, NSAIDs, gabapentin and pregabalin).

Multimodal pain therapy has been shown to provide effective pain relief. Pain involves multiple mechanisms; therefore, using a multimodal approach provides improved pain management. The act of combining different analgesics (non-opioid with an opioid) has been shown to have additive and/or synergistic effects (Elvir-Lazo & White, 2010). This synergistic effect reduces the amount of opioids required to achieve adequate pain control. Decreasing the amount of opioids decreases drowsiness, and decreases the incidence of postoperative nausea and vomiting (PONV) ultimately; providing an improved quality of care, and patient satisfaction.

It is a human right to have effective pain control, and a moral obligation of healthcare professionals to provide it. Under treatment of pain can lead to: thromboembolic complications,

pulmonary complications such as pneumonia, increased length of stay, hospital readmission for further pain management, needless suffering, impairment of quality of life, and the development of chronic pain (American Society of Anesthesiologist, 2012). The American Pain Society made a similar statement acknowledging that a “key adverse effect of poorly controlled acute pain is progression to chronic pain (2001). The possibility of being plagued with a disabling effect for a lifetime is extremely alarming. “Chronic pain has a distinct pathologic basis, causing changes throughout the nervous system that often worsen over time. It has significant psychological and cognitive correlates and can constitute a serious, separate disease entity” (Pizzo & Clark, 2012, p. 198). The recent realization that uncontrolled acute pain can lead to chronic pain creates an even higher demand for the obligation of providing evidenced based, high quality pain management.

An in-service regarding best practice in management of acute pain in the acute care setting was delivered to staff nurses on an orthopedic floor of a community hospital where the author serves as a Clinical Nurse Educator.

### **Theoretical Framework**

The middle-range theory by Good and Moore is clearly a framework of support for the topic of acute pain management. The theory is fairly new, developed in 1996. The theory of balance between analgesia and side effects focuses on acute pain management of operative pain. This theory was created from the 1992 guidelines put out by the Agency for Health Care Policy and Research on acute pain management. This theory advocates exactly what this project entails; using a non-opioid along with an opioid. The theory does an excellent job putting all the elements of pain management together creating a comprehensive blueprint for success.



The model has three branches or statements. The first statement involves multimodal interventions, recommending a potent pain medication (like an opioid), with the addition of an adjuvant (like an NSAID, acetaminophen, gabapentin or pregabalin) along with a nonpharmacologic adjuvant. The second statement recommends attentive care including regular assessments of pain and side effects, along with intervention, reassessment, and re-intervention until the goal of pain relief has been met. The third statement involves patient participation with teaching and goal setting for pain relief. Combining all three of these branches or statement together is designed to work together like a recipe to obtain a balance between analgesia and side effects. This nursing theory will be used as a guide by the author when teaching and implementing an improvement to pain management in the clinical setting. Use of this theory would include a good understanding of the concepts and definitions. The concepts and definitions of the Good and Moore theory are presented below in table 1.

The theory has five assumptions. The assumptions are: "1) that the nurse and physician collaborate to effectively manage the acute pain, 2) that an opioid or epidural is indicated, 3) that medication for side effects is given as needed, 4) that patients are adults with the ability to learn, set goals, and communicate symptoms, and 5) that nurses have the current knowledge of pain management" (Good and Moore, 1996, p. 78). The assumptions point out two major areas of importance for improving pain management. The nurses and physicians need to work closely together as a pain management team, and the nurses need adequate knowledge to improve pain management.

The theory also has identified some limits. The theory is not tailored to address acute pain in children, elderly, or patients with special problems such as opioid tolerance, hepatic or renal impairments, shock, trauma, or burns (Good and Moore, 1996).

Table 1

**Concepts and definitions of the Good and Moore acute pain theory.**

Concepts	Definition
<b>Potent pain medication</b>	Morphine-like compound or epidural local anesthetic that the patient receives for postoperative pain
<b>Pharmacologic adjuvant</b>	NSAIDS given as adjuvants to potent pain medication
<b>Nonpharmaceutical adjuvant</b>	Relaxation, music, imagery, massage, or cold for relief in addition to potent pain medication
<b>Regular assessment of pain and side effects</b>	Report of pain on a pain scale and report of side effects of potent pain medication every 2 hours until pain is under control and then every 4 hours
<b>Identification of inadequate pain relief and unacceptable side effects</b>	Report of pain intensity that is greater than mutually agreed upon safe realistic goal, or side effects that are unacceptable to the patient or judged unsafe by the nurse
<b>Intervention, reassessment, and reintervention</b>	Prompt intervention for regular pain and side effects; reassessment at time of peak effect, and reintervention if the pain or side effects are unacceptable
<b>Patient teaching</b>	Teaching the patient preoperatively and reinforcing postoperatively about patient attitudes and expectations, reporting pain, obtaining medication, prevention of activity related pain and use of adjuvants
<b>Goal setting for pain relief</b>	Safe realistic goal of reported relief mutually decided on daily by the patient and the nurse
<b>Balance between analgesia and side effects</b>	Patient satisfaction with relief of pain according to safe, realistic goals set with the nurse, and with side effects that are safe and acceptable

*Note. Adapted from. " Clinical Practice Guidelines as a new source of middle-range theory: focus on acute pain," by Good, M., & Moore, S. 1996, Nursing Outlook, 44(2), p.77.*

### Process

A search was conducted using the University of North Dakota Harley French Library. The Pub Med, Cochrane Library, and CINAHL databases were utilized. Using the search term, *Postoperative acute pain* with the following limits; published in the last 10 years, English, humans, adults, meta-analysis, practice guidelines, randomized controlled trials, and clinical trials. Initial search produced 508 articles that become the foundation of the study. Other valuable search words included *multimodal analgesia* (138 articles), *perioperative pain*

*management* (160 articles), *analgesic, non-narcotic administration* (212 articles). The search also included the following websites; the American Pain Society (APS), Agency for Health Care Research and Quality (AHRQ). Reference pages of some of the individual articles were also very valuable in finding good quality research articles. A total of 510 articles were examined for information pertaining to multimodal pain management, or the following medications; Tylenol, NSAIDs, gabapentin and pregabalin. A total of 58 relevant, articles were more closely reviewed, ending up with a final of 15 high quality articles.

### **Review of Literature**

The literature review consists of 15 high quality articles. Three meta-analysis, three Cochrane systematic reviews, four systematic reviews, one practice guideline update, one randomized control trial (RCT), one prospective RCT, one comparison study, and one quasi-experimental study. Six of the reviews are specific to perioperative multimodal pain management involving an opioid with a NSAID. One review involved acetaminophen with an opioid. One of the meta-analyses compared the effectiveness of acetaminophen, COX2 inhibitors and NSAIDs along with morphine. Another review analyzed the combination of three medications together; acetaminophen, a NSAID, and an opioid. A comparison study analyzed Patient Controlled Analgesia (PCA) morphine, with a multimodal approach of gabapentin, acetaminophen and opioids. The last two medication reviews involved gabapentin with opioids, and pregabalin with opioids.

Three of the fifteen articles reviewed practice guidelines. One review was performed by the American Pain Society (APS), and one from the American Society of Anesthesiologists. The final article involved a quasi-experimental design study involving the implementation of using the recommended evidence based orders.



According to Elia, Lysakowski, and Tramer all nonopioid analgesics are morphine sparing and truly analgesic in minor and major surgeries (2005). The morphine sparing effects of acetaminophen was found to be 20%, COX2 inhibitors at 25%, and other NSAIDs at 40% Elia et al. (2005). A number of high quality reviews analyzed acetaminophen, NSAID's, gabapentin, and pregabalin in different combinations for their effectiveness in the management of perioperative pain. The results are categorized below according to specific drug categories.

### **Acetaminophen**

The multimodal use of acetaminophen and codeine was studied and found to be clinically useful in reducing pain by 50% in approximately 50% of patients (Toms, Derry, Moore, & McQuay, 2011). Clinical trials suggest that a 33-50% decrease in pain intensity is meaningful from a patient perspective and represents a reasonable standard of intervention efficacy (American Society of Anesthesiologist, 2012). A Multimodal approach of combining acetaminophen, a NSAID, along with an opioid was found to be a superior combination than either drug alone with an opioid (Ong, Seymour, & Lirk, 2010). In fact, results were favorable for the combination of all three medications in 85% of the studies (Elia et al., 2005). Effectiveness was measured as a result of lower pain scores, lower supplemental analgesic requirements, or a better globally assessed pain relief (Elia et al., 2005). The combination of a NSAID and an opioid was also compared to the combination of all three medications. In 65% of the studies the combination of all three medications was more effective than a NSAID and opioid alone (Elia et al., 2005).

### **NSAIDs**

Numerous studies analyzed NSAID's; some on an individual basis and some analyzed as a group. NSAID's as group were found to reduce morphine requirements by 40% (Elia et al.,

2005). The NSAIDs studied individually include: ketorolac, celecoxib, ibuprofen, and naproxen.

### **Ketorolac**

A multimodal approach using ketorolac and morphine produced positive results, by reducing the morphine requirements needed in the postoperative period (Cepeda, et al., 2005). Another high quality study (category A1 evidence) suggests that when ketorolac is combined with IV morphine pain scores are lowered (American Society of Anesthesiologist, 2012).

### **Celecoxib**

Celecoxib decreases postoperative pain and decreases the need for opioid containing analgesic medication after ambulatory surgery (White, et al, 2007). Celecoxib was also studied by Derry, Barden McQuay and Moore in 2010. The results further support its uses as a multimodal approach to postoperative pain management. Participants experienced a clinically useful reduction in pain.

### **Ibuprofen**

Ibuprofen was shown to be an effective intervention to decrease pain intensity. In fact a “very substantial amount of high quality evidence demonstrates that ibuprofen is an effective analgesic in treating postoperative pain” (Derry, Derry, Moore & McQuay, 2011a). Doses at 200mg, and 400mg were analyzed. Forty six percent and fifty four percent of the participants experienced at least a 50% relief of pain (Derry et al., 2011a).

### **Naproxen**

Naproxen was shown to be an effective intervention to decrease pain intensity. Naproxen was studied at 200/220mg, 400/440mg and 500/550mg. Naproxen reduced pain level by 50%; in 45%, 49% and 50% of the participants (Derry, Derry, Moore & McQuay, 2011b).

### **Gabapentin & Pregabalin**

Gabapentin and Pregabalin are classified as anticonvulsants. They have both been used as an adjuvant analgesic in multimodal pain management. They both have been found useful in acute and chronic pain. Gabapentin was shown to reduce total opioid consumption and postoperative pain at rest and with movement (Peng, Wijeyesun, & Li, 2011). A multimodal approach using acetaminophen, gabapentin and opioids was found to be superior to morphine per PCA. The patients that received the multimodal approach of acetaminophen, gabapentin and opioids seemed to have a better quality of pain control, and a significant reduction in total opioid consumption (Rajpal et al, 2010). Category A1 evidence suggests that gabapentin and pregabalin when combined with IV opioids lowers pain scores (American Society of Anesthesiologist, 2012).

Pregabalin was also shown to reduce opioid consumption, but was not proven to reduce pain intensity according to Zhang, Ho, and Wang, (2011). This review would be considered less reliable due to the number and types of limitations noted. One might be cautious using this medication without further evidence.

### **Additional Benefits of a Multimodal Approach**

Acetaminophen, NSAIDs, gabapentin and pregabalin offer additional benefits. In addition to reducing pain they have been shown to decrease the adverse effects of opioids; like nausea, and sedation (Rajpal et al, 2010). A meta-analysis specifically studied the effect of NSAID's on opioid adverse effects. The results affirm those of Rajpal et al.; that NSAID's decrease the incidence of postoperative nausea and vomiting (PONV) and sedation (Marret, Kurdi, Sufferey, & Bonnet, 2005). Studies by Elia et al., and Cepeda et al. resulted with similar results; that NSAID's decrease morphine related side effects like nausea and vomiting postoperatively. Zhang et al. found that pregabalin reduced opioid related adverse effects



significantly. Peng et al. found that adding gabapentin to the multimodal approach reduced nausea, vomiting and pruritus. White et al. found that using the NSAID celecoxib improved the patient satisfaction scores, improved bowel function and recovered one day earlier and resumed their ADL's two days earlier.

A multimodal approach was also found valuable in decreasing the functional interference from pain. Patients were less likely to consider pain an interference of walking, coughing or deep breathing (Rajpal et al, 2010). Fewer side effects could certainly facilitate achievement of one of the major surgical goals; getting patient up, moving, and back to their home environment.

### **Safety of Medications**

Acetaminophen has been associated as one of the safest and well tolerated medications for pain management when used at its recommend dose (Pasero & McCaffery, 2011). One of the concerns would be the potential for liver damage (Toms et al, 2011). It is recommended that acetaminophen be used at doses under 3 grams a day, and used cautiously in with patients with hepatic disease. NSAIDs are also considered to be a safe medication with few adverse effects. The common adverse effect involved the GI system. One of the specific concerns in the perioperative setting is the potential of a postoperative bleed. A patient could bleed from the incision site, or gastrointestinal (GI) site. Other potential side effects include; acute liver injury, acute renal failure, heart failure and adverse reproductive outcomes (Toms et al, 2011). These types of outcomes would be more likely to occur with chronic use of NSAIDs, and generally present fewer risks with short term postoperative pain management (Derry et al, 2011a). Cyclooxygenase-2 (COX-2) inhibitors like celebrex are associated with fewer adverse GI effects than nonselective NSAIDs (Derry, Barden, McQuay, Moore, 2010). According to a study done by

Peng et al., gabapentin would need to be used with caution because the dizziness and increased sedation that accompanies it (2007).

### **Current Guidelines Promoting Multimodal Pain Management**

The American Society of Anesthesiologist established guidelines to be used by anesthesiologist, other physicians and all healthcare professionals who manage perioperative pain. One of the suggestions includes the use of a multimodal approach to pain management. The society states that a patient should receive an around-the-clock regimen of COXIBs, NSAIDs, or acetaminophen; unless contraindicated. Dosing regimens should be administered to optimize efficacy while minimizing risk. The choice of medication therapy needs to be individualized to each individual patient (American Society of Anesthesiologist, 2012). The guidelines were established by a large panel of experts. The majority of experts (92%) agreed that the implementation of the guideline would not require changes in practice that would affect costs (2012).

The American Pain Society (APS) revised and expanded the 1995 guidelines for the treatment of acute pain and cancer pain. The recommendations specify that all care settings formulate a multilevel systems approach that is sensitive to the type of pain and sensitive to the population they serve. They encourage prompt recognition and treatment along with patient and family involvement. They state that efforts to improve the quality of pain management must move beyond assessment and communication to implementation and evaluation of improvements in pain treatment that are timely, safe, evidence based and multimodal (Gordon, et al. 2012).

A study was done in 2006 to assess the effectiveness of evidence base orders. Evidence base orders included; morphine with an NSAID, a specific dose tailored to the individual patient, and around-the-clock administration. Findings suggested that using evidence based orders

resulted in lower pain scores, fewer disturbances in sleeping, walking, and general activities (Bédard, Purden, Sauve-Larose, Certonsini, and Schein, 2006).

## **Discussion**

### **Outcome/Dissemination**

The focus of the presentation was to update nurses working in the acute care setting on basic pain management terminology and expose them to some of the evidence based guidelines and tools out there to help manage pain. This includes findings of the multimodal pain therapy review. The presentation was intended to be persuasive in motivating the nurses to use the Good and Moore theory to guide a process change toward the use of evidenced based pain management practices. Eighteen staff nurses attended the presentation. The presentation was thirty five minutes in length with a ten minute post presentation discussion.

The response from the presentation was positive. An evaluation of the presentation was completed by all attendees (Appendix B). The evaluation asked how well the presenter achieved the stated objectives using a five point likert scale: poor, fair, good, very good, and excellent. Over eighty percent of the ratings were in the very good and excellent category. The knowledge levels before and after the presentation were rated using the same likert scale. Sixty six percent of the participants reported improved knowledge levels on pain management. Another question asked if the information they received from the presentation would influence a change in how they practice nursing. The results of this question were most impressive. Sixty eight percent of the nurses answered yes, based on what they learned in this presentation, they plan to make changes in how they practice. The presentation stimulated a good group discussion on some of the challenges we encounter with pain management in the hospital. I believe the presentation was

a first step to a positive change in pain management. The table below depicts a more detailed representation of the evaluation.

**Table 2**

**\ Presentation Evaluation Results**

Evaluation Questions	Excellent	Very Good	Good	Fair	Poor
Presenters knowledge about subject matter	27.4%	54.5%	18.1%	0%	0%
Prepared and organized	36.4%	63.6%	0%	0%	0%
Ability to communicate well	27.4%	54.4%	18.1%	0%	0%
Objective: Recall current pain terminology	36.5%	45.4%	18.1%	0%	0%
Objective: Identify some of the properties of Multimodal Pain therapy and current practice guidelines.	57.3%	28.5%	14.2%	0%	0%
Objective: Identify some of the components of the acute pain guidelines and how they relate to the nursing theory on acute pain	57.3%	28.5%	14.2%	0%	0%
Objective: Recall some of the pain management nursing tools available.	57.3%	28.5%	14.2%	0%	0%
Objective: Recall some of the pain					



management nursing tools available.

Overall strength of the presentation	42.8%	42.8%	14.4%	0%	0%
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Based on what you learned in this program	Yes	No	Unsure		
will you be changing anything in the way	68%	11%	21%	—	—
you practice medicine?					

**Implications for Nursing**

Pain is an expected reaction from tissue injury in the postoperative setting, yet it is often inadequately managed. The literature review revealed some clear cut guidelines to manage acute pain. Pain management is expected to be individualized, timely, safe, evidence based and multimodal. Multimodal therapy was one of the major focuses of the project. Evidence strongly suggests that multimodal pain therapy is useful in reducing pain and minimizing side effects.

The information summarized in this review significantly impacts nursing practice, education and research. The implications of this review also reflect the need for policy development in hospitals. Data has suggested that clear pain management guidelines have been created, yet not all facilities or providers follow them. It will be important that nurses in the community, state and nation take an active role in understanding and implementing evidence based care in the management of pain. Implementing these evidence based guidelines would be a big undertaking. A process change like this would involve a number of stakeholders; administration, the physicians, pharmacy and the nurses. Education would be the first and foremost step in order to demonstrate and convince all stakeholders of the need for change.

The most important focuses of this project was to learn the best way to manage postoperative pain in the acute care setting. One of the biggest surprises the literature revealed was that unmanaged acute pain can lead to chronic pain. This finding unveils a potential positive effect on the surrounding community. By appropriately managing acute pain in the acute care setting, we may be able to decrease the number of community members plagued with chronic pain. Nurses again, would play a very important role in influencing the use of evidence based orders, and educating patients on the importance of proper management of acute pain in preventing chronic pain.

This literature search provided a wealth of information on acute pain management, providing step by step guidelines. One area of acute pain management that continues to be a bit blurred is the patient experiencing acute pain with a history of chronic pain or chronic opioid use. Multiple articles expressed the challenges of caring for these patients (Brill, Ginosar & Davidson 2006; Hadi, Morley-Forster, Dain, Horrill & Moulin 2006; McJunkin, Riley, Lilly, Casto & Bowe 2010; Rapp, Ready & Nessly 1995; Richebe & Beaulieu 2009; Thomas 2003). Some literature has recommended the use of multimodal therapy for this specific subpopulation, yet, clear cut recommendations have not been established (Carr & Linderoth 2010; Gordon et al 2012). There is a clear need for further research about managing acute pain in patients with chronic pain (Brill et al., 2006; Carr & Linderoth 2010; Gordon et al., 2012; Swenson, Davis & Johnson 2005). Since chronic pain, now affects approximately one third of the population, there is a great need for further research for these patients (Brill et al., 2006; McJunkin et al., 2010; Richebe & Beaulieu 2009). Nursing and healthcare in general would highly benefit from high quality research and/or guidelines for managing acute pain in a patient with a history of chronic pain or chronic opioid use.



### Summary/Conclusion

High quality studies on acute pain management involving multiple agents such as NSAIDs, or acetaminophen in addition to opioids provide an outstanding confirmation of the initial clinical question. Adding multiple agents to opioids provides more effective pain management; by reducing opioid consumption, decreasing pain intensity, and decreasing opioid related side effects. A dose of acetaminophen cannot replace, or fulfill the need for an opioid. An NSAID alone wouldn't be able to substitute the need for opioids in a patient experiencing acute postoperative pain. Yet, as a "team" per se, they all work nicely together. Gabapentin and pregabalin are some other options to keep in mind for pain management, especially when chronic pain is a factor.

Ordering medications is beyond the nurse's scope of practice. Nurses would need to use this information wisely. This evidenced based practice information can be used to empower nurses. By understanding multimodal pain management nurses would be able to use the ordered medications more appropriately. A knowledgeable, empowered nurse can also collaborate with the providers, and pharmacist to assure the most appropriate pain management is available.

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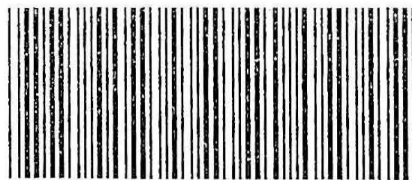
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