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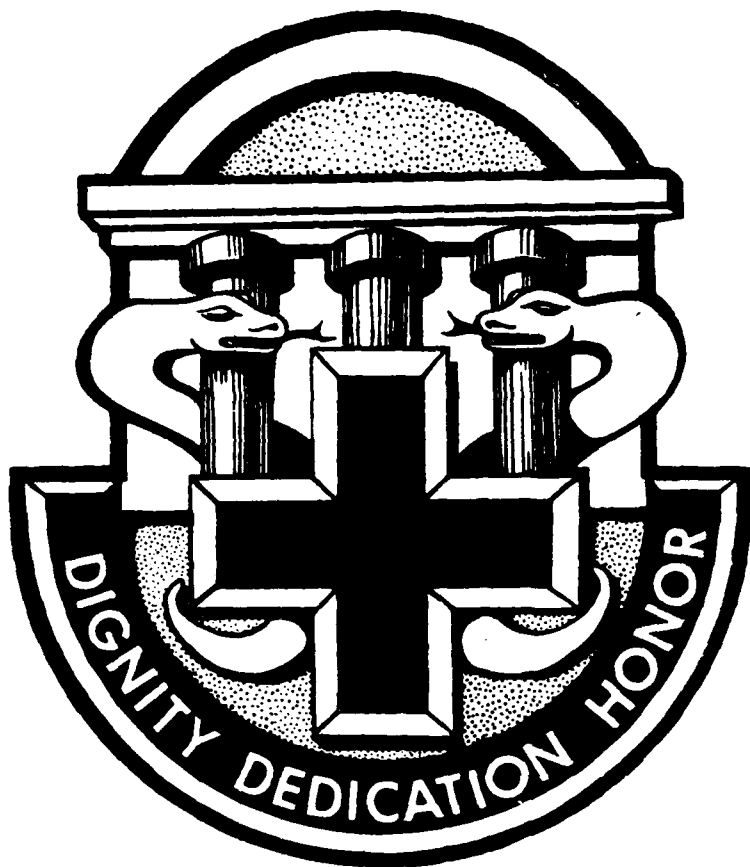
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DIAGNOSIS AND TREATMENT OF PHANTOM LIMB PAIN:
MECHANISMS AND OPTION FLOW SHEET.
DDEAMC # 81-19-1 August 1982

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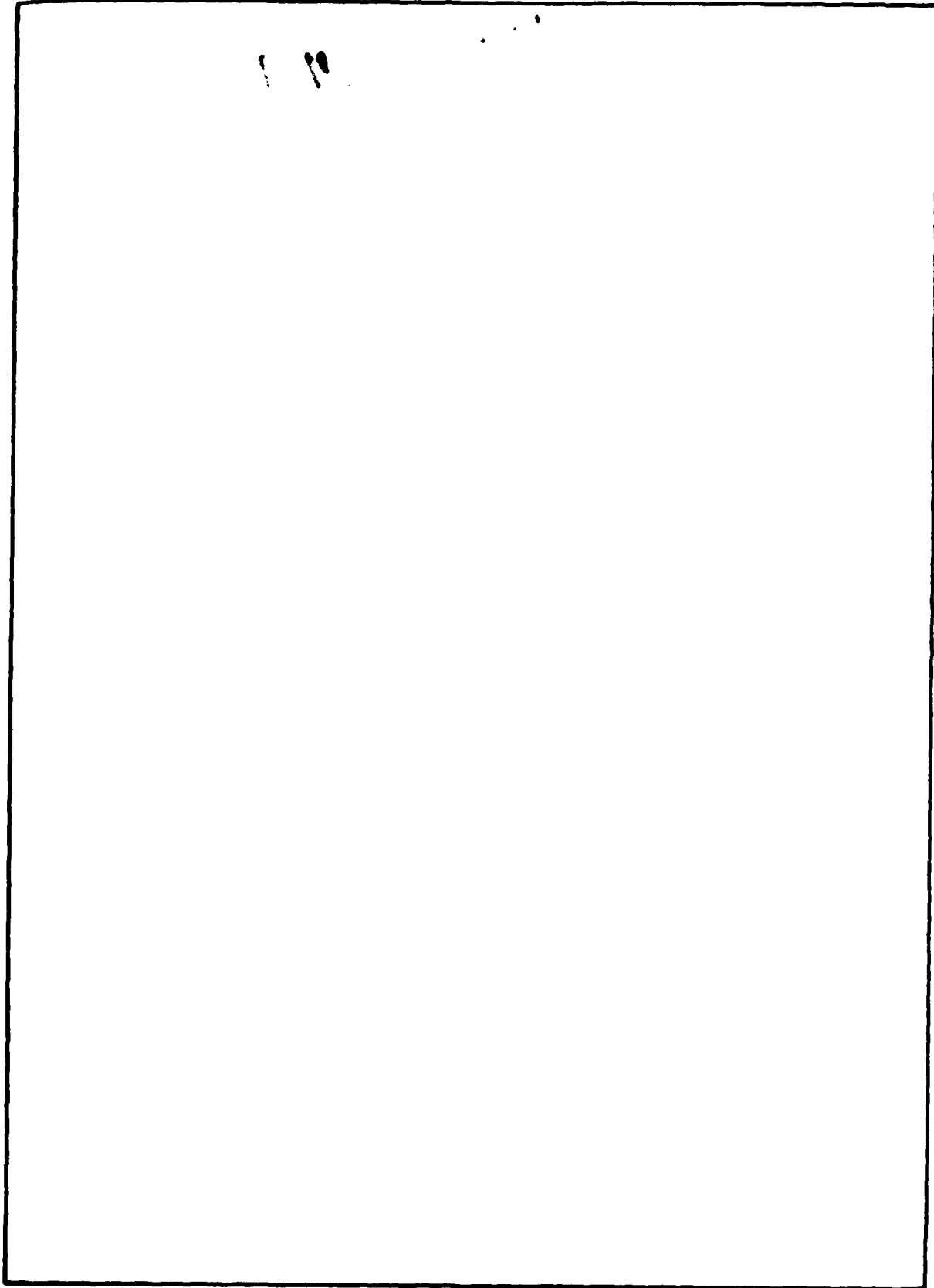
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The basic mechanisms underlying phantom pain as well as the diagnostic and treatment procedures are difficult to keep track of and coordinate during both teaching and clinical application. A figure summarizing the major mechanisms is provided along with the rationale upon which each treatment is based. A flow sheet outlining when to do each diagnostic and treatment procedure and providing options based on results of each is provided to simplify teaching and keeping track of progress through a complex process. Only treatments with at least a fair success record on follow-up are included.		

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DIAGNOSIS AND TREATMENT OF PHANTOM LIMB PAIN: MECHANISMS AND OPTION FLOW SHEET.

Richard A. Sherman*

TREATMENT OVERVIEW AND RATIONALE:

Phantom limb pain should be recognized as a special case of referred pain in which the pain can be referred from a wide variety of locations for many reasons utilizing several interdependent psychophysiologic mechanisms. Successful treatment of phantom pain depends on the ability of the health care team to be alert diagnosticians, able to trace the source of referral when only minimal and confusing clues are available.

Many theories have been developed to account for phantom limb pain. Most of those having a modicum of neurophysiological and clinical evidence to support them are summarized in Figure 1. Several are based on pain mechanisms previously related to causalgia and have not been discussed in relation to phantom pain in previous articles.

FIGURE 1 ABOUT HERE

The treatments suggested here are based on: (1) the theoretical mechanisms discussed here and elsewhere, 1,3,5,6,9,10,12,15 (2) clinical experience by us 7,9 and by the hundreds of health care providers responding to our phantom pain treatment survey, 11 (3) an updated version of our analysis of the literature, 8 and (4) especially, on responses to our phantom feelings surveys by over 3,000 amputees who identified which treatments actually did work and for how long.¹⁰

The major types of treatments recommended and their theoretical bases are as follows:

1. Appropriate standard treatments are given to areas referring pain into the phantom such as back and bowel problems, impinged nerves, etc.

2. EMG muscle tension feedback from the stump is given to dampen and to disrupt the shooting pain associated with the stump spasm cycle. The cycle hypothesis involves a self sustaining positive feedback system which includes remaining portions of these nociceptors originally innervating the amputated portion of the limb, the spinal cord, the muscles in the stump which once controlled movement of the amputated area, and the stump nociceptors. Impulses from the nociceptors originally ending in the amputated area would cycle through the spinal cord to the stump muscles. Muscular responses would stimulate the

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stump nociceptors as well as the remaining portions of the nociceptor nerves arising from the amputated area, thus continuing the cycle.

3. Modalities such as sympathetic blocks, temperature feedback from the stump, and chemical sympathetic depressants are used to reduce peripheral sympathetic arousal. This, in turn, reduces the stimulation and sensitization effects that efferent sympathetic fibers have on afferent nociceptors from the amputated limb which are located in the same nerve bundle. Shortcircuiting of efferent sympathetic fibers and afferent nociceptors may occur in the neuroma and is frequently related to causalgia like burning pain.²⁰ Beta blockers may be of some use to treat this portion of the problem. A recent report shows success upon follow-up with propranolol,⁴ and theoretically they should have a positive effect on these kinds of problems¹³ but prior reports were not promising.^{8,9}

4. Prosthetic refitting and gait correction are used to eliminate nociceptor sensitization and hyper-reactivity caused by release of algesics from sores, from damaged blood vessels, and from the body's normal physiological responses to chronic destructive physical stress in the stump. Treatments reducing physical stress to the more normal appearing proximal portions of the stump are especially important. These areas are far more sensitive than corresponding areas on the intact limb.^{2,3}

5. Chemical, behavioral, and relaxation techniques are used to treat exaggerated stress responses, anxiety, and depression to minimize their effects of pain magnification and reinterpretation of benign signals into painful ones.¹⁴ These treatments can also reduce sympathetic arousal and disrupt the pain-tension-anxiety cycle.

6. TENS and ultrasound at the stump are broad, low intensity stimuli used with the rationale that closing the pain gate will temporarily disrupt any self sustaining pain cycles in progress. These treatments are used concomitantly with treatments aimed at permanent control of the pain gate to avoid their effects of quickly wearing off. Disrupting the cycle, even temporarily, is still very important because it prevents permanent establishment of and disrupts chronic pain systems - both physical and behavioral. It gives the patient a hiatus during which longer lasting skills can be learned.

The mechanisms discussed above would lead to the prediction that acupuncture and hypnosis would be of some highly transient benefit by temporarily closing the pain gate from the peripheral and central axes of the nervous system respectively. However, as is found with TENS and ultrasound, a longer lasting treatment should be used concomitantly with them to take advantage of the temporary disruption of the pain cycles. By extension of these models, modalities such as resection of the stump and excision of a neuroma should tend to exacerbate the pain. The predictions are supported by the literature.^{8,10,11}

PREAMPUTATION PREPARATION:

The patient should be told about expected, normal phantom sensations and about the possibility of phantom pain. The concept of nerves from the limb to be amputated remaining intact and responsive between the stump and brain can be introduced at this time to reassure the patient that these feelings and pains are neither unusual nor a sign of madness. This discussion is vital to the patient's ability to

incorporate seemingly impossible sensations into his new perceptions of himself. It should decrease the number of hysterical reactions and help prevent magnification of benign phantom sensations into painful ones through excessive attention, anxiety, and depression cycles.

WITHIN ONE WEEK POST AMPUTATION:

Watch for magnification of pain due to acute stress, psychotic, and grief reactions to loss of the limb. These intense acute pains can usually be resolved with simple reassurance and explanation. When necessary, several short psychiatric interventions are helpful.

Many recent amputees experience severe acute phantom pains closely associated with even more severe acute stump end pain. This is probably partially because nociceptors are directly stimulated and their firing thresholds are reduced by algesics released by damaged tissues and blood vessels. Nociceptors cut and damaged during the amputation are probably especially sensitive. Another contributing factor is probably sympathetic hyperarousal due to physical stress in the stump and due to mental stress from the amputation circumstances. Patients can be honestly reassured that these pains will decrease substantially as the acute stump pain from the amputation process resolves. The immediate post amputation period is well suited to review the normality of phantom sensations and the expected occurrence of at least occasional discomfort in the phantom. Reassurance and teaching by physicians and other medical staff can go a long way toward preventing patients from developing habitual reinterpretation of normal phantom sensations into painful ones which can be magnified with anxiety-pain cycles on a chronic basis. The idea that it is not "insane" to experience phantom pain should be emphasized to staff and patients alike to permit generation of an accepting, knowledgeable, understanding atmosphere. The patient's overall attitude toward prosthetic adjustment and re-entry into normal life can have a profound influence on the extent to which normal psychological and physical difficulties are interpreted as painful sensations. Figure 1 illustrates some of the painful phantom feelings which can be expected. It appears vital to explain the mechanism through which referred feelings and pain originate and to give examples of these phenomena if patients are to accept their feelings as not being fancied. We usually use examples of intense referred sensations from common life situations such as the headache resulting from quickly eating very cold ice cream and the tingling sensations in the fingers following a sharp blow to the elbow. The relevant pain mechanisms described in Figure 1 are frequently discussed at this time. The exacerbating effects of stump conditions, weather, fatigue, and stress on both phantom and stump pain are described.

SUBCHRONIC AND CHRONIC PHANTOM LIMB PAIN:

The subchronic period is the interval between the acute post amputation phase and the chronic pain phase. It is the optimal time to begin treatment in order to minimize the establishment of resistant chronic pain patterns which are exceedingly difficult to disrupt.¹⁴ The factors discussed with acute amputees should be reviewed with the patient. The diagnosis-treatment guide presented in Figure 2 can be used to avoid missing crucial information and to select the optimal treatments currently available for each particular case. The flow sheet includes the basic steps to follow in diagnosis and treatment of phantom limb pain including frequently missed diagnostic problems identified in surveys by amputees and physicians. All treatments having reasonable success rates on follow-up are included.

FIGURE 2 ABOUT HERE

Referred pain from back injuries, intestinal problems and stump problems must be dealt with prior to any treatments aimed solely at phantom pain. Poorly fitting prostheses and other stump problems should also be rectified before initiation of phantom pain treatments. Trigger points, stump spasms (both micro and macro), and local circulatory problems frequently play a major role in initiation and intensification of phantom pain so they must be properly evaluated. Bear in mind that phantom pain is a therapeutic problem. If all modalities from Figure 2 fail, the prognosis for invasive intervention is exceedingly dim. The only resource currently available to patients not successfully treated with the above methods is referral to pain control centers specializing in helping patients learn to live with their pain.

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FIGURE 1

PHANTOM PAIN AND POSSIBLE MECHANISMS

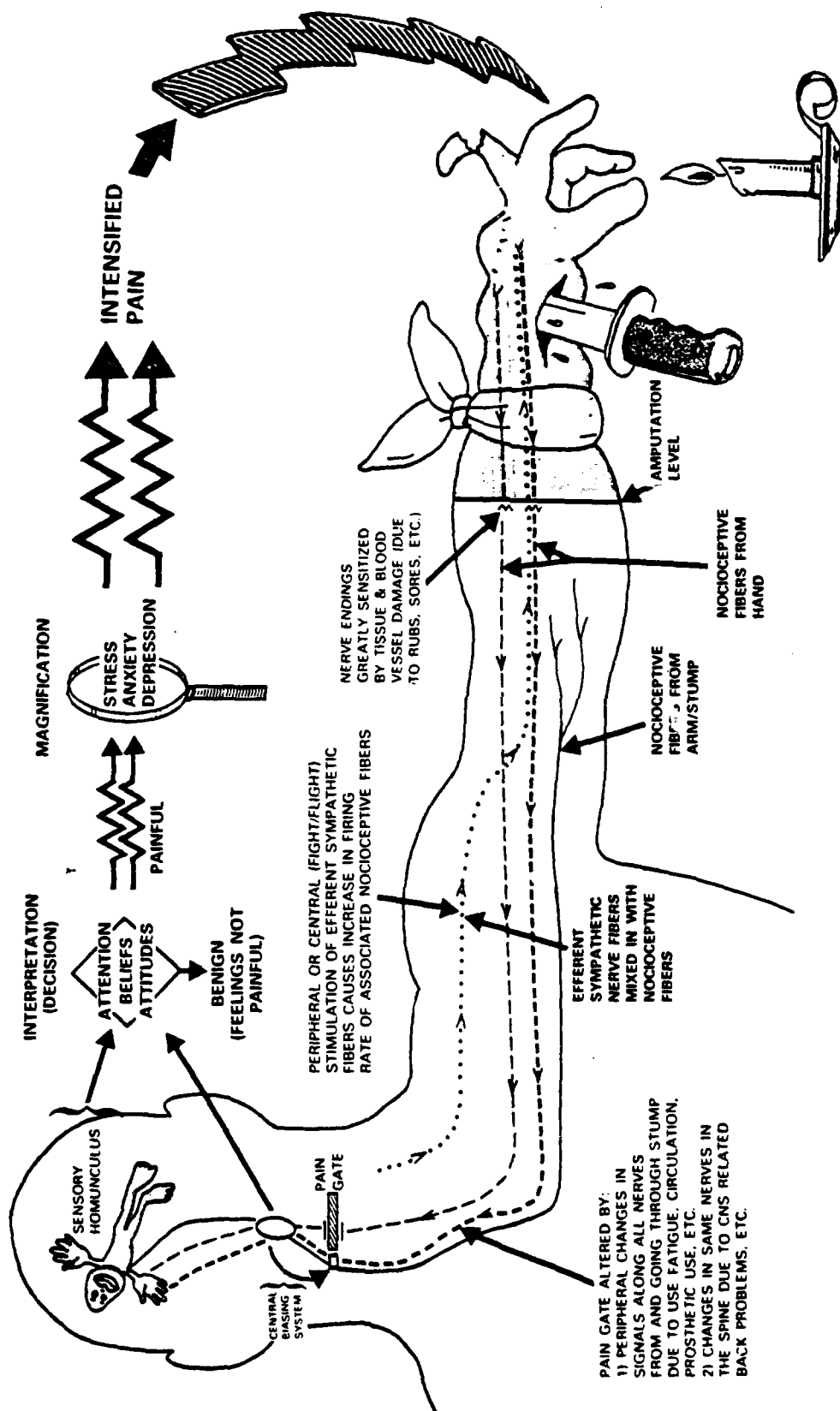


Figure 2

FLOW CHART OF DIAGNOSIS AND TREATMENT OF PHANTOM PAIN

During initial interview take time to establish a warm relationship with the patient. Listen to symptoms and environmental correlates of the pain. Openly discuss (1) the role of central nervous system mechanisms (not called psychological) in which slightly elevated depression, anxiety, and stress act as major magnifiers of pain, (2) physical and mental stress resulting in musculoskeletal and cardiovascular responses which in turn cause pain, and (3) mechanisms of referred pain. Patient should be reassured that problem is common and not a psychiatric one.

Very careful evaluation to uncover subtle stump problems. Crucial tests frequently not performed include (1) surface EMG of major stump muscles for unusual tension levels and micro/macro spasms/tremors and (2) stump circulation and temperature checks. Crucial questions frequently not asked include those identifying and differentiating between cardiovascular, musculoskeletal, and intestinal stress responders.

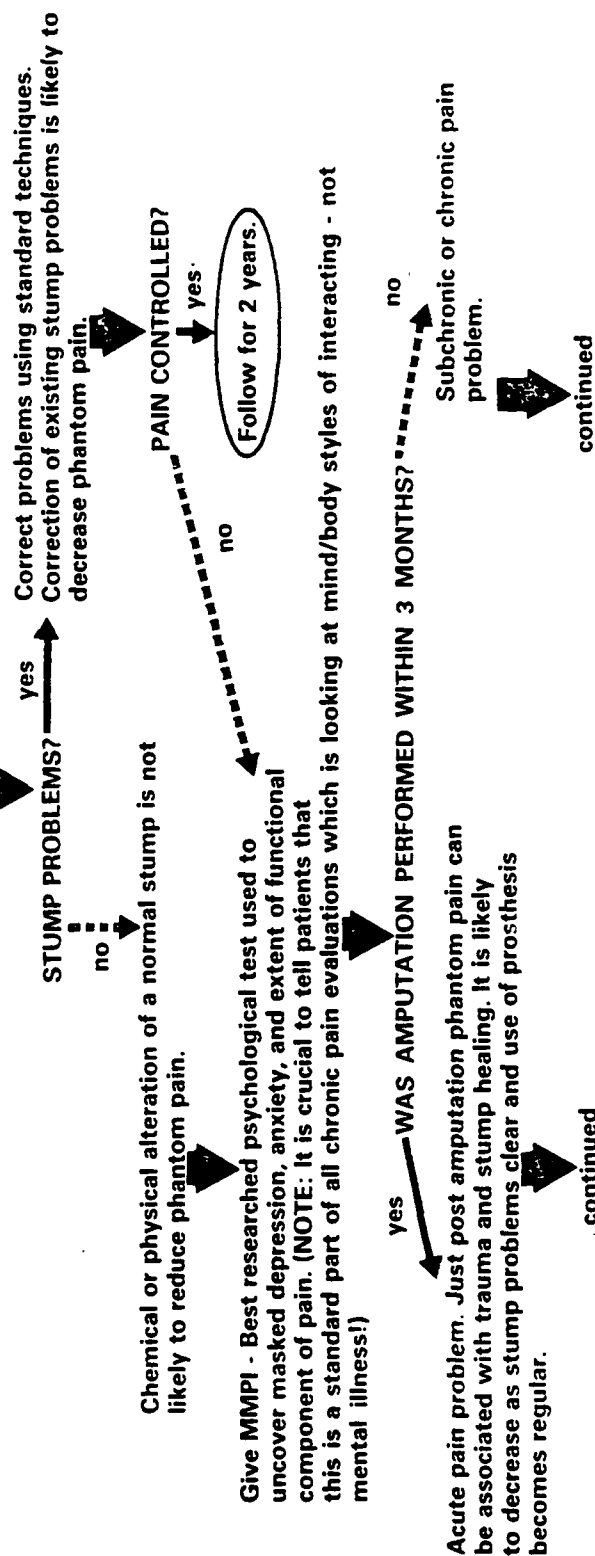


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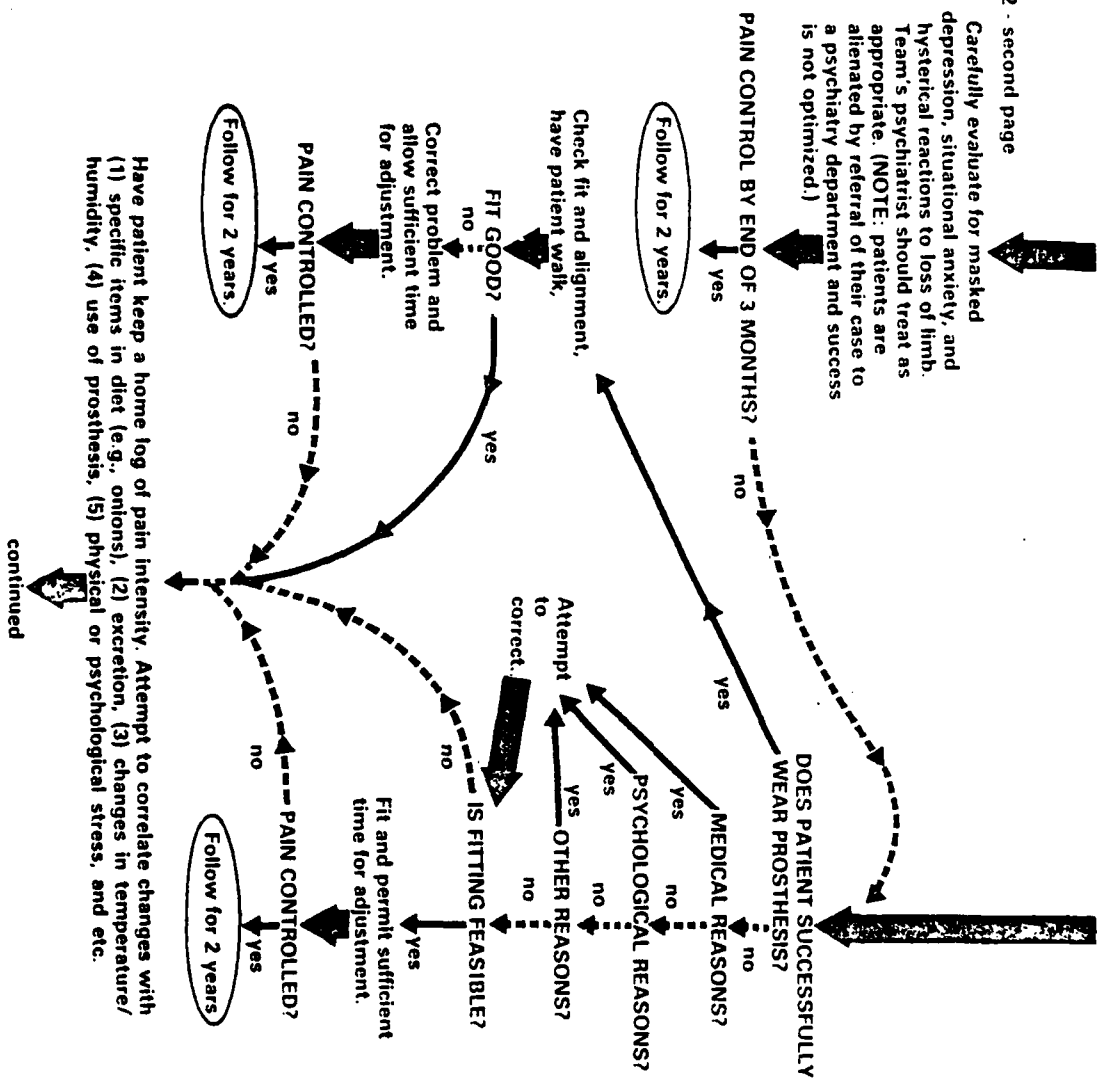


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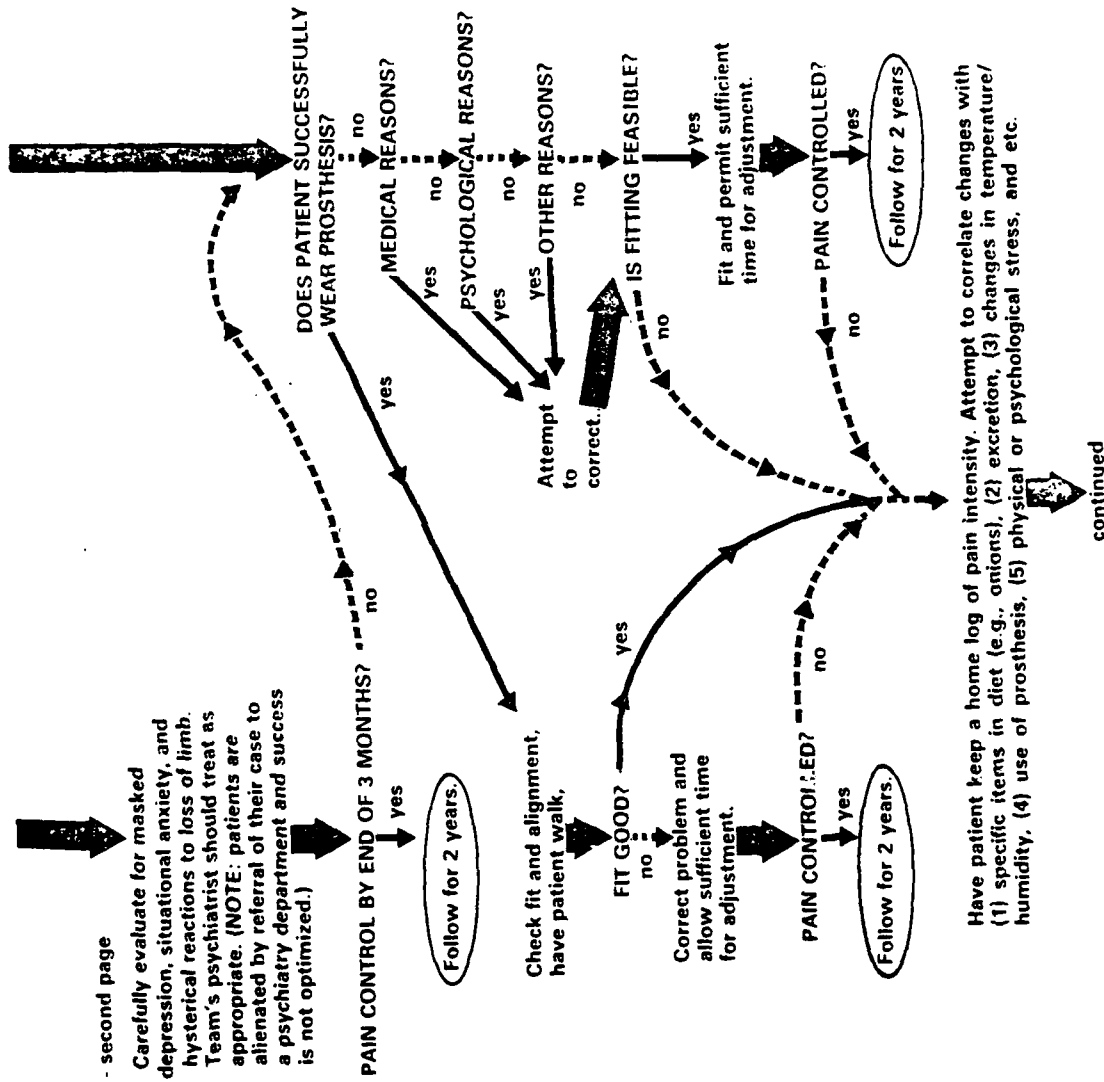


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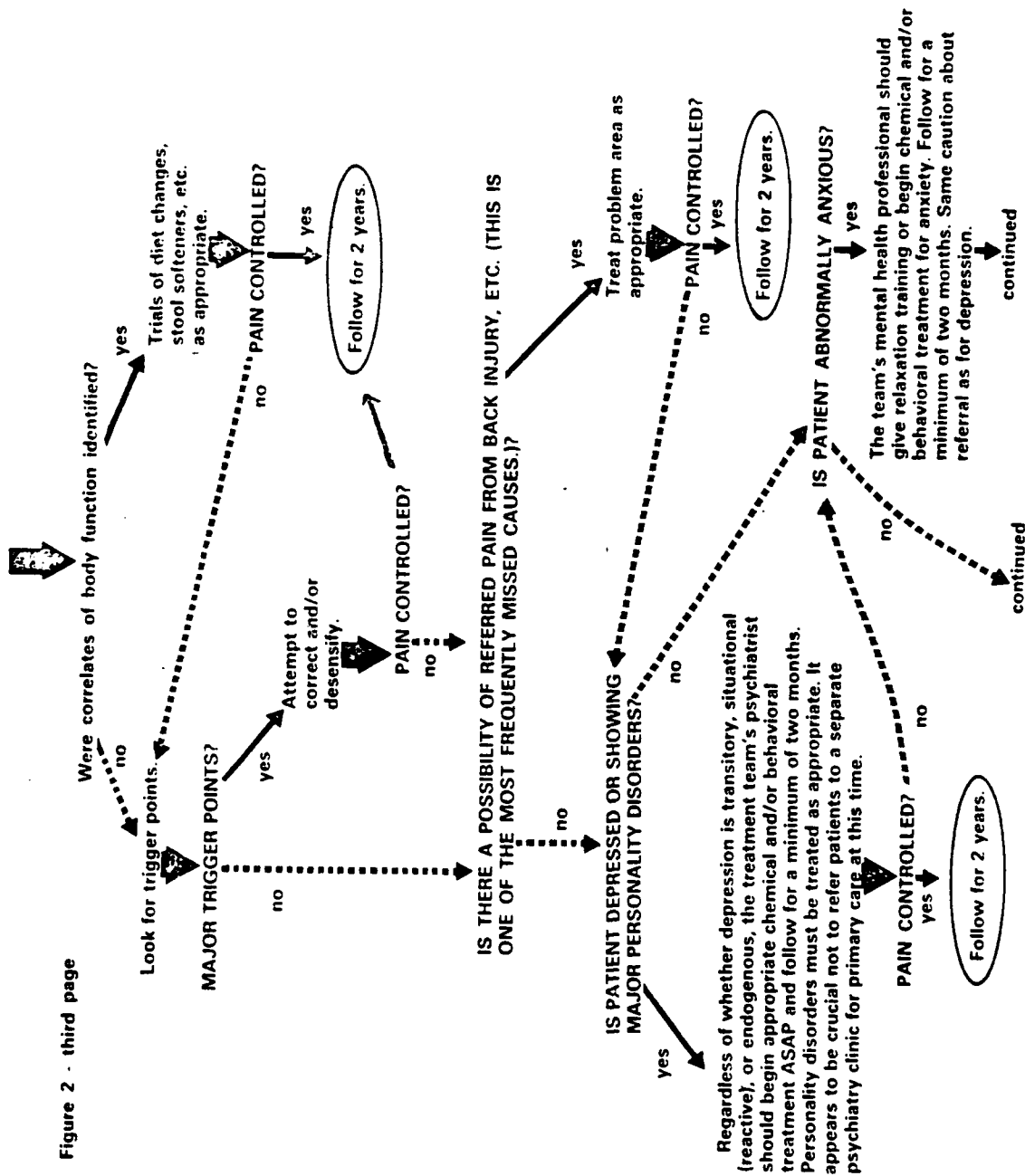
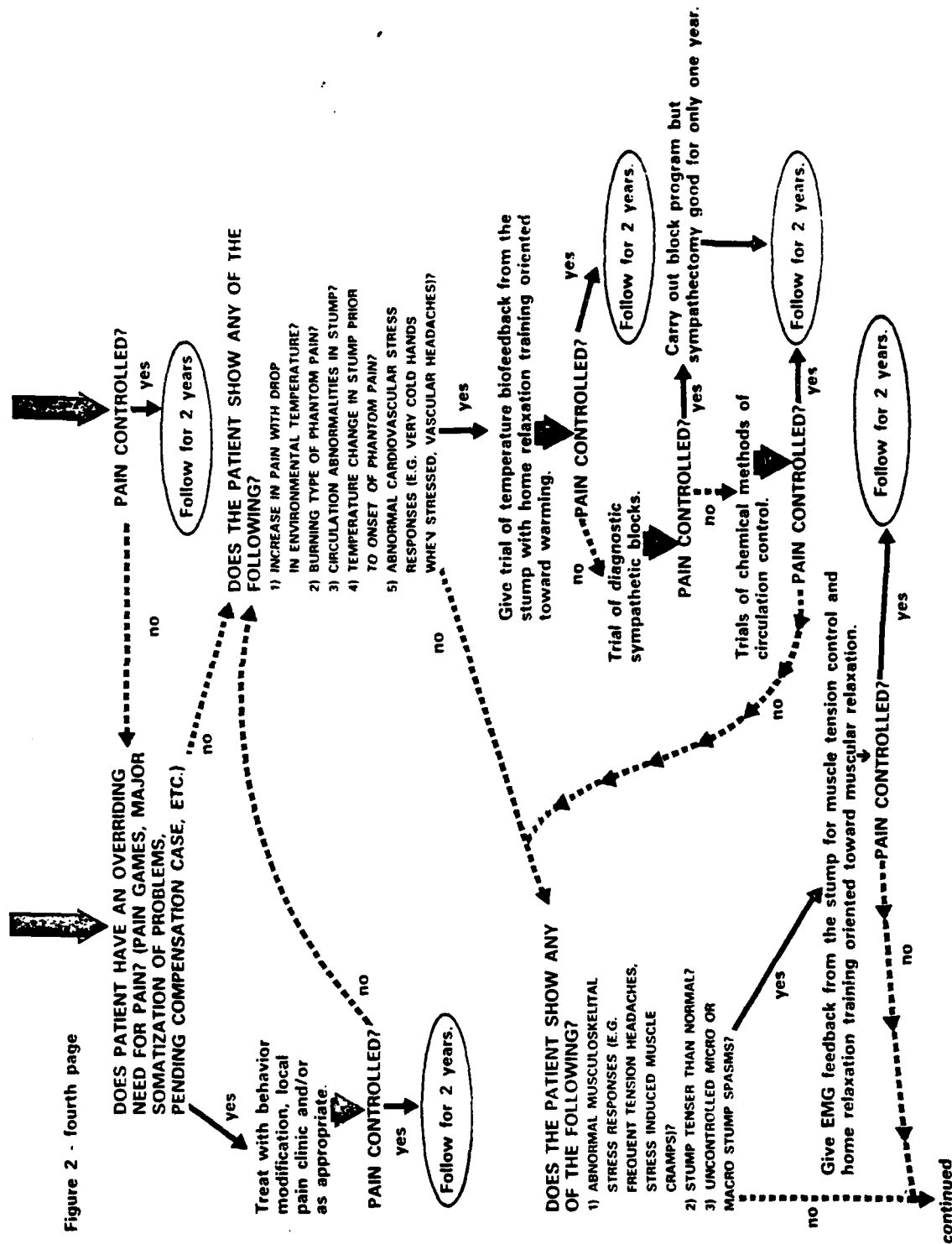
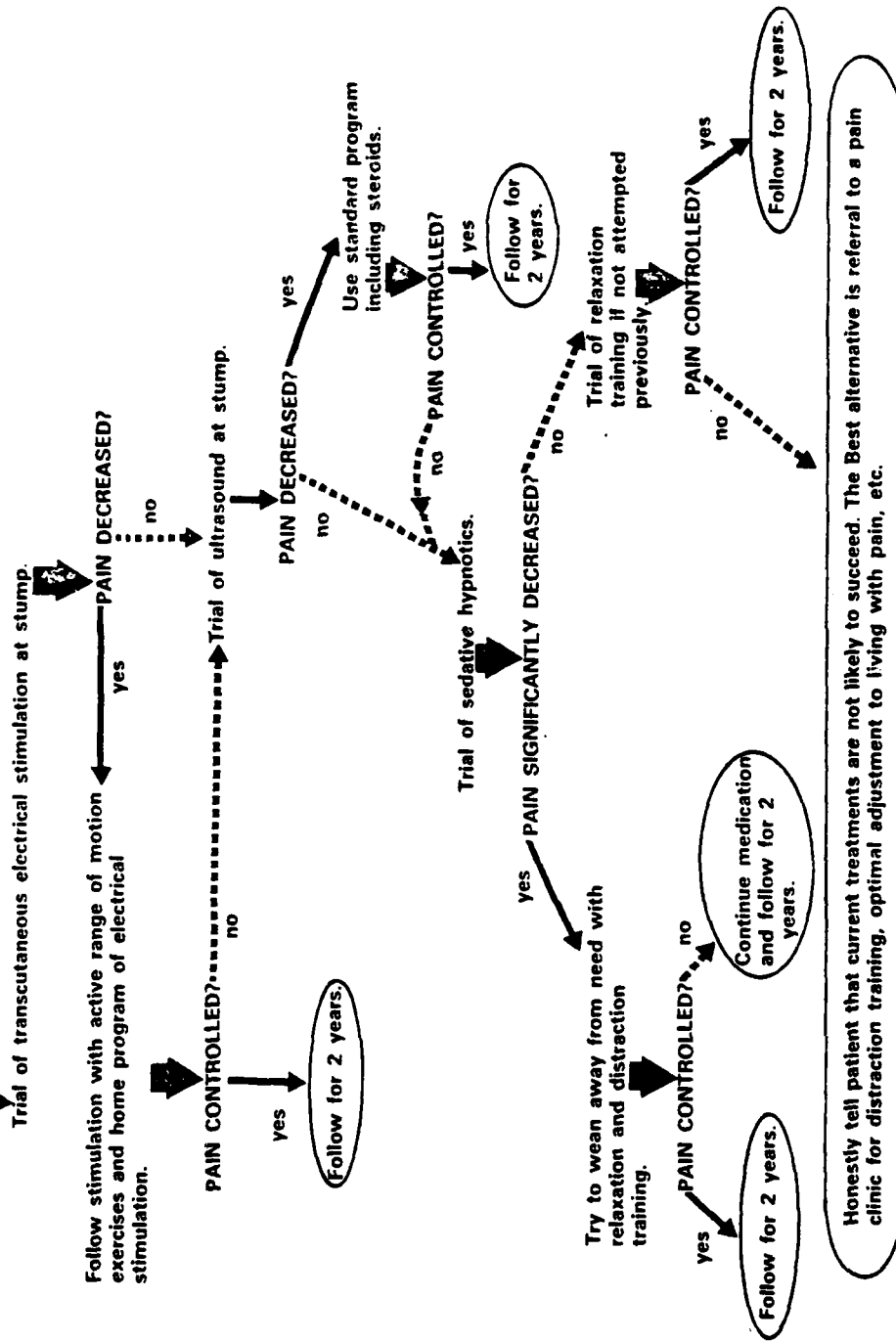


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Figure 2 - fifth page



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