The Pain Management Core Curriculum for European Medical Schools

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An interdisciplinary teaching approach
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Foreword

All clinical working physicians will meet patients suffering from pain. Pain is the main reason for patients visiting their general practioner. Due to these facts any physician needs to have basic knowledge about the pathophysiology of pain and should be able to use at least simple resp. first line treatments.
The establishing of specialized pain management and various educational initiatives for practicing physicians failed to improve the situation of a greater portion of patients suffering from pain. The lack of general pain management teaching in medical school is considered to be an important reason for this observation.
Contrary to "special pain management" which should be reserved to specialists with specific postgraduate training for complex pain syndromes, students should be taught in "general pain management" to prepare them for the majority of patients in pain with common pain.
The core curriculum's goal is not to teach the whole field of pain management but is intended to concentrate on frequent pain syndromes and basic treatment options. It is the intention of the authors, that with the implementation of the core curriculum students – after passing through their academic education – will be able to know: how to identify patients suffering from pain, the understanding of pain and its influence on the patient's life and how the patient is experiencing the pain, methods of analgesia, with which effective pain management for most of the patients is possible, as well as how to apply those methods and how to classify them in graduated schemes including non-pharmacological approaches and how to evaluate the efficiency of pain management.
The main focus of the core curriculum is to teach students to understand the following four pain syndromes: acute posttraumatic resp. postoperative pain, cancer pain, neuropathic pain and chronic
non-cancer pain. The authors hope that the core curriculum encourages students and deans alike to be concerned with pain management for the sake of our patients.

I. Introductory Remarks

This core curriculum has been specifically developed to provide the content for a defined number of teaching sessions in interdisciplinary pain management for third to fifth year medical students. It is not intended as a complete summary of required pain knowledge. Examples of common pain conditions are used for teaching the essential concepts of pain management - within an interdisciplinary context, and in a bedside setting.

As formal lecture time will decrease in the future, there will be a necessary reduction in transmission of factual knowledge and a greater emphasis on the understanding of essential concepts. This core curriculum also enables instructors from different disciplines to share a common "philosophy" of pain knowledge. This will clarify learning objectives and avoid unnecessary overlap.

The curriculum headings and chapters have been chosen for their relevance to the clinical requirements of trainee general practitioners. As a result, the understanding of the development of chronic pain has been emphasised, and overlapping with other courses has been avoided.

The curriculum has been designed as a core curriculum to allow additional expansion, according to the requirements and special interests of any local faculty. The educational objectives were formulated according to Bloom's taxonomy[*].

It is expected that the core curriculum will be updated biannually to incorporate new research findings and advances in evidence-based practice.

[*] Educational objectives (learning targets) are classified by learning domains according to a classification scheme. Distinctions are made between cognitive, affective, and psychomotor behaviour. Bloom's taxonomy is the most significant taxonomy in the cognitive domain. The cognitive domain encompasses behaviour patterns such as knowing, remembering, thinking, problem solving, concept formation, and creative thinking.

The areas of knowledge, comprehension, and application are relevant to this curriculum

a) 'knowledge': knowledge of terminology, individual facts, principles, theories, and structures (side effects of medications, treatment options),
b) 'comprehension': learnt information is recognized within another context by way of extrapolation and interpretation (identification of a patient at risk of developing chronic pain, correlations between analgesia and postoperative stress syndrome),
c) 'application': encountering a new problem and resolving it by means of a suitable abstraction (preparation of basic individual therapy plans, completion of a prescription conforming to the prescription regulations for narcotics).

Reference: Bloom B. (1971) Taxonomy of Educational Objectives, The Classification of Education Goals, Handbook I: Cognitive Domain / Deutsches Ärzteblatt 2004; 101: 28.

II. Educational Framework for Teaching Interdisciplinary Pain Management

- Multidisciplinary lecturers (ideally interdisciplinary instructors working in tandem).
- Teaching of the main concepts of the core curriculum (optional expansion with additional material will depend on the local availability of any additional teaching time).
- Supplementation of lectures and practical instruction with self-study based on the core curriculum (which parallels the educational objectives).
- Required sessions:
    - 5 lectures lasting 45 minutes each,
    - 5 clinical bedside teaching sessions lasting 90 minutes each (The groups should include a maximum of 6 students and include taking a patient history followed by a case discussion).
- Overview of module structure:

Module	Lecture	Bedside instruction	Chapter
1	Introduction: physiology and psychology of pain, history and examination, pain assessment		1.1 to 1.3
2	Acute pain	Acute pain	2
3	Cancer pain	Cancer pain	3
4	Neuropathic pain	Neuropathic pain	4.1 to 4.2
5	Development of pain chronicity	Development of pain chronicity	5.1 to 5.2
6		Specific therapeutic populations and challenges*	6.1 to 6.3

* Optional; can also be integrated into modules 1 through 5.

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IV. *Core Curriculum for Teaching Pain Management*: Educational Objectives

0 Prefaces

Every practicing physician is confronted with pain problems of their patients. Pain is the most common reason for patients to see their general practitioner. For this reason, every physician should be able to diagnose pain correctly and institute treatment using simple algorithms and interventions.

Most Medical School Curricula refer to pain and its treatment only in general terms, and the existing curricula and learning objectives are not suitable for teaching pain management. This curriculum therefore addresses medical students during their clinical semesters providing them with the core knowledge and core skills for the diagnosis and treatment of pain in a comprehensive and coherent fashion, both in outpatient and inpatient settings. The students should acquire the content of the curricula in an appropriate fashion by the means of bedside instruction, lectures, practical training and OSCE examinations (Leila-N-M, Eur J Pain 2006; 10: 167 / Sloan-PA, JPSM 2001; 21: 298).

The practitioner should become skilled in "general pain management", and is not expected to acquire the specialized knowledge required to diagnose and treat complex chronic pain disorders. The goal is to enable the alleviation of neuropathic, acute post-traumatic, post-operative and cancer pain, to recognize patients with chronic pain, to use measures to prevent the development of chronic pain and to arrange for further specialized treatment when indicated. Furthermore, the practitioner is to understand that pain is a multidimensional and complex phenomenon, which necessitates specific diagnostic tools and effective management.

The practitioner should understand that there are specialist therapists and multidisciplinary specialist units (pain clinics, acute pain teams, and palliative care teams) in acute, chronic and cancer pain management who can help, support and advice on pain problems and treatment. These include doctors, nurses, physical therapists, occupational therapists, psychologists and many others who study the assessment, management and treatment of pain as a specific discipline.

Primarily, students should:

- be able to identify patients with pain and measure pain,
- learn to understand a patient's pain and all its implications for the patient's quality of life,
- know and apply the methods of analgesia which offer effective pain control for the majority of patients, and to classify those methods in a graded scheme,
- be able to evaluate the effectiveness of a particular pain management,
- know and be able to apply the indications for appropriate psychotherapeutic treatment for pain.

In particular, students should be able to differentiate between and to know the basic principles of specific treatment of four main syndromes:

- acute post-traumatic and post-operative pain,
- cancer pain,
- neuropathic pain,
- chronic non-cancer pain.

The essential *cognitive* learning objectives for the students are:

- the pathophysiological and psychological consequences of inadequately treated acute pain;
- the treatment of cancer pain (and its importance as an integral part of palliative medicine);
- development of a basic understanding of neuropathic pain and its treatment;
- knowledge regarding the difference between patients with straightforward pain syndromes and those with more complex underlying chronic pain mechanisms, and the subsequent implications for treatment.

The essential *applied* learning objectives are that students should be able to perform the following:

- the unassisted taking of a specific pain history;
- consideration of the bio psychosocial dimensions of pain;
- a simple symptom-oriented physical examination;
- the writing of prescriptions conforming to the prescription regulations for opioids and other restricted medications;
- to provide examples of simple analgesia schemes for post-operative, neuropathic and cancer pain.

The essential *emotional* learning targets are:

- a knowledge of potential (unconscious) interactions and feelings of helplessness towards chronic pain patients;
- an awareness of the dynamics and significance of cancer pain for the patient with consideration of the destructive and terminal nature of the illness.

The *Core Curriculum for Teaching Pain Management* is guided by the following underlying principles:

- patients have the ethical and human right to structured and adequate pain treatment;
- the diagnosis of pain and its management are an integral part of all medical care;
- pain is a bio psychosocial phenomenon;
- pain has to be regularly assessed and documented, both quantitatively and with regard to its functional consequences;
- pain management requires an interdisciplinary and interprofessional approach;
- continuing education, the reviewing of treatment algorithms and the application of ethical principles are a prerequisite for a professional approach to pain management.

1 Introduction: principles of pain management

1.1 Principles of pain management

1.1.1 Definition of pain

In 1979, The International Association for the Study of Pain (IASP) published the following definition of pain: "Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."

This definition of pain illustrates that emotional-affective factors have to be considered, in addition to physical and pathophysiological changes which form the foundation of the bio psychosocial understanding of pain. The intensity and characteristics of pain are always perceived differently by individuals, and pain is therefore always subjective. In the choice between treatments, a distinction between acute and chronic pain is always necessary.

The students should be able to name and explain the bio psychosocial model. They should know that pain can develop and persist even without a physical lesion or noxious stimulus. They should be aware of the subjectivity of pain, as well as have gained sufficient knowledge and skills to apply the relevant tools for pain assessment (see section 2.2).

1.1.2 Physiology of pain

The development, transmission and processing of pain signals

The understanding of the physiology of pain is a prerequisite for the understanding of the mechanisms of sensitization and desensitization.

The students are to understand the principles of the physiology of pain, specifically that

- nociceptive stimuli are detected by specific structures (nociceptors) which are the free nerve endings of Aδ and C fibres (transduction),
- nerve excitation is passed on to the spinal cord in the first neuron,
- the synaptic transmission to the CNS occurs in the spinal cord or brain stem
- at the supra-spinal or –bulbar level, interactions with other centres exist, generating the subjective perception of pain.

The students are to know the principles of peripheral and central sensitization mechanisms, namely that

- nociceptors are subject to sensitization processes in which inflammatory mediators (e.g. prostaglandins, bradykinin) play a key role (this underpins the clinical indication of the use of nonsteroidal anti-inflammatory drugs),
- sensitization processes might occur at the spinal cord level in which the NMDA receptor, among others, plays a major role (e.g. ketamine – which may not be used as routine analgesic - is a NMDA-receptor antagonist),
- additional sensitization processes might occur at the cerebral level (e.g. cortical reorganization).

The students are to know the terms “cortical reorganization” and “sensitization”: sensitization mechanisms can result in permanent changes, such as a loss of inhibitory interneurons (cortical reorganization). Both structural and biochemical changes can lead to intensified perception of pain stimuli (spinal and central sensitization).

The students are to know that

- pain-inhibiting mechanisms take place in the brain, spinal cord and peripheral tissues in which inhibitory interneurons or non-neuronal cells are involved (clinical indication, e.g. the use of transcutaneous electrical nerve stimulation = TENS),
- cerebral mechanisms for descending pain control exist, which are transduced via opioid and α-2 receptors, among others. Norepinephrine plays an important role in this mechanism (clinical implication, e.g. analgesic efficacy of norepinephrine reuptake inhibiting tricyclic and selective norepinephrine reuptake inhibiting antidepressants).

1.1.3 Psychology of pain

The psychosocial correlations in the development and maintenance of pain

The full understanding of the fact that psychosocial factors are involved in the development and maintenance of pain, and therefore chronicity, is fundamental for the successful implementation of an integrated bio psychosocial treatment plan.

The students are to know the following factors that influence the perception of pain:

1.1.3.1 Affective factors
- depression (intensified perception of pain, employment of passive coping strategies, insufficient central pain control mechanisms)
- anxiety (increasing avoidance behaviour, increased muscle tension)

1.1.3.2 Cognitive and behavioral factors
- classical conditioning (e.g. the association of arousal and pain)
- operant conditioning (e.g. loving attention from the partner)
- cognitive factors (expectations, suggestions)
- observational learning (e.g. children in their immediate family)
- loci of control and expectations of self-efficacy
- strategies for coping with pain (increased risk associated with passive strategies as well as strategies based on perseverance)

1.1.3.3 Social influences
- low satisfaction at the work place
- social withdrawal because of the pain problem
- social legislation or medico-legal compensation cases that are pain-related (e.g. for pension or compensation payments)
- domestic stress
- conflicting goals inhibiting the healing process (retirement pension claims, changing eligibility for claims in the domestic or work environment)

1.1.3.4 Psychiatric and psychosomatic comorbidity
- depressive disorders
- anxiety disorders
- somatoform disorders
- post-traumatic stress disorder

1.1.3.5 Placebo effect
The students are to know that expectations and effects of pre-conditioning account for the placebo effect, e.g. simple "placebo tests" are not suitable to verify the actual pain of a patient.

1.1.4 Classification of pain: acute and chronic pain

Pain is classified as "acute" or "chronic" according to its duration

It is very important to distinguish between "acute" and "chronic" pain syndromes, because different and additional mechanisms are responsible for the development of chronic pain. These fundamentally affect the diagnosis as well as the treatment, and a failure to recognize the risk factors for chronicity can cause irreversible disease progression. This means that, in addition to the duration of pain, physiological and psychological changes are also particularly relevant. For example, pain may become chronic after four months, or it may not be considered chronic even after eight months.

The students must know the characteristics of acute pain: a duration of less than 3 to 6 months, a useful and life-sustaining function (protective function), facilitated healing through immobilization, uncomplicated psychological processing and social acceptance; as well as of chronic pain: a duration of more than 6 months, a loss of the warning and protective function, pain lasting beyond the healing phase, complex psychosocial interactions and the development of a bio psychosocial symptom complex.

The students should recognize chronic pain development mechanisms and be able to name specific examples (see section 5.1). The students should be aware, in particular, of the relevance of the early detection of chronic pain (prevention of chronicity, e.g. the duration of non-specific back pain correlates negatively with a return to work).
The students should be able to name the differences in the diagnosis, investigation and therapy of acute and chronic pain (monomodal and simple treatment algorithms for acute pain vs. multimodal and complex treatment strategies for chronic pain; adequate diagnosis and therapy of the bio psychosocial dimensions of pain chronicity). In addition, the students should be aware of the importance of the interdisciplinary treatment of chronic pain and should be able to name examples of the multimodal concept (see section 3.3).

1.1.5 Classification of pain: nociceptive and neuropathic pain

A number of existing types of pain can be classified as nociceptive, neuropathic or a combination of nociceptive and neuropathic pain.

History and a simple physical examination allow the distinction between nociceptive and neuropathic pain. This distinction guides the use of different analgesics.

The students should be able to name examples of the characteristic qualities of nociceptive pain (dull, pressing, pulling, throbbing, boring, spasmodic, colicky) and neuropathic pain (electric shock-like, stabbing, burning, "pins and needles"). During the physical examination, the students need to be able to locate the pain and its radiation pattern, as well as determine other neurological signs and symptoms. This will need to be understood in the context of the relevant peripheral and dermatomal (spinal) nerve supply.

1.1.6 Treatment indications: acute and chronic pain

Every patient has a right to pain treatment. Acute pain should be treated immediately, unlike chronic pain which requires a different approach.

The immediate administration of analgesics for acute pain, by titration, reduces not only suffering but also morbidity and mortality. Applying the same principle to patients with chronic pain, however, can lead to continuing and iatrogenic chronicity.

Acute pain of high intensity that is caused by cancer, or experienced after an accident or surgery, can usually be controlled immediately with non-opioid analgesics and with opioids. The analgesics are titrated in order to determine requirements individually. Chronic pain, however, can only be successfully treated if appropriately diagnosed following an extensive history, examination and evaluation. Treatment does therefore not rely on the exclusive administration of opioid and non-opioid analgesics. A multimodal therapeutic approach, within an interdisciplinary framework, can only be developed after all the factors contributing to the development and maintenance of the pain have been determined.

1.1.7 Typical comorbidity of pain

Depressive, somatoform and anxiety disorders are part of the diagnosis and therapy of pain.

Depressive, somatoform and anxiety disorders affect the patient's coping strategies and have to be identified in order to effectively treat acute pain, and in particular chronic pain.

The students are to be aware of the main disorders that may further impair patient functioning and that are required to be additionally treated (see section 1.3.3). This includes screening questions related to general psychological changes including mood, motivation, affect and quality of sleep, as well as the recording of reactive behaviour (to the adverse consequences of the pain and the disorders) - such as social withdrawal or fear-avoidance behaviour. Evidence of unusually stressful life events and circumstances at the time of the onset of pain is relevant to the differentiation of somatoform disorders. If there is evidence of severe psychological distress, the investigation of suicidal tendencies is obligatory. The students are to know (and to be able to communicate to the patient) that psychological and emotional dysfunction can significantly and comprehensively affect the treatment of pain; and that this therefore requires a bio psychosocial model framework.

1.2 Diagnosis

1.2.1 General pain history

The detailed description of the pain by the patient and any resulting functional loss or disability

As objective measurements of pain are lacking, the specific pain history often provides the essential information needed for the differential diagnosis of the cause of pain and the selection of the pharmacological and non-pharmacological pain treatments. During the history it is important to ask "who is experiencing the pain" as well as "what type of pain" is being experienced.

The students should be able to conduct a structured history in order to record information about the pain, and to document this information. The students are to maintain an open, self-critical and impartial attitude, and they have to be able to create a confidential and undisturbed environment for the history and examination. In addition, the students are to know that the history of chronic pain patients allows not only the collection of information, but is also therapeutic in applying interpersonal (accepting the pain and the patient), educational (contending for the view of the illness) and motivational (improving self-efficacy) interventions.

The students should be able to use the following structured history:

- quality of pain: affective (gruelling, terrible) vs. descriptive (burning, drilling): mainly affective terms might suggest a degree of chronicity with other descriptors suggesting nociceptive (pressing, boring) or neuropathic (nerve lesion) pain (injection-like, burning),
- localisation of pain: reproducible, anatomically classifiable (see body image),
- intensity of pain: verbal vs. non-verbal behaviour, threshold values for intervention,
- onset and duration: progression over time, daily rhythm of the pain (e.g. increase of pain during the night or improvement through movement for inflammatory pain),
- exacerbating or relieving factors: degree of pain control.

The students are to be able to recognize signs of adverse coping strategies and maladaptive responses to painful situations. These will include fear-avoidance beliefs, outward signs of pain behaviour as well as a heightened subjective experience of disability and the presence of social and financial deprivation. The ways in which pain influences the emotional experience and social situation of a patient have to be fully understood. Knowledge of the screening questions for anxiety, depression, and somatoform disorders is required.

The history is supported by an appropriate physical examination. Prior knowledge of neurological and orthopaedic examination techniques are expected for the interdisciplinary subject of pain management. Advanced diagnostic techniques for differential diagnosis should be covered in the major curriculum subjects. The students, however, should understand that there is often no correlation between the results of the imaging techniques and the cause of pain and those diagnostic nerve blocks can provide important information in selected cases.

1.2.2 Pain rating tools

Analogue scales and questionnaires

The use of questionnaires facilitates early stratification of patients, supporting an efficient and more relevant initial consultation. Analogue scales provide a record of treatment progress. The use of questionnaires, pain diaries and analogue scales to complement history and physical examination are part of the essential documentation for every pain treatment plan.

The students should be able to use numerical rating scales and visual analogue scales (NRS and VAS) and to make therapeutic decisions based on these scale values (intervention at > 3/10, emergency intervention at > 7/10). Students should be able to name on questionnaire used to understand the impact of pain in chronic pain patients, e.g. the Brief Pain Inventory (BPI), the West-Haven-Yale Multidimensional Pain Inventory (MPI-D), or the (Short Form) McGill Pain Questionnaire (resp. national equivalents to these internationally used pain questionnaires).

1.3 Principles of pain treatment

1.3.1 Causal and symptomatic principles of treatment

Indications for causal and/or symptomatic treatment approaches

The choice between a treatment based on predominantly causal or symptomatic approaches (or a combination of both) is made based on the diagnosis, the progression of the disease, and the advantages and disadvantages. In all situations possible, a pain diagnosis should be made before the start of therapy.

The students should know that in pain management a distinction is made between a causal and a symptomatic mode of treatment. The students must know that the factors involved in choosing an exclusively or predominantly symptomatic approach to treatment will include the evidence from diagnostic methods, an assessment of disease severity as well as the advantages and disadvantages for the patient. The students must know that symptomatic pain management is an essential component of palliative care. They furthermore should understand that during the progression of incurable diseases, a distinction has to be made between medical treatments that aim to prolong life; and medical treatments that aim to increase the quality of life of a patient, and that the latter may include the cessation of life-prolonging treatment. Completing and stopping treatment can both reduce quality of life.

The students are to know that palliative care has the following distinctive features:

- it is the treatment of active, progressive, and advanced diseases that no longer respond to any curative therapies
- of patients who have a distinctly limited life expectancy
- where the emphasis is placed on achieving preservation of or improvement in quality of life
- as well as on the patient's autonomy concerning the choice of therapy
- for which the highest priority is placed on pain control and the control of other

medical conditions, as well as psychological, social, and spiritual problems
- which requires interdisciplinary cooperation in diagnosis and treatment
- and calls for the acceptance of the process of dying and of death as part of life and for the caring support of relatives.

1.3.2 Pharmacological and non-pharmacological pain treatment

Pharmacological and non-pharmacological methods of pain relief are the main cornerstones of all pain management.

An effective pain treatment requires the full knowledge of the basic principles of pain management *and the ability to apply them. For patients with acute neuropathic or cancer pain, the use of opioids as well as NSAIDs and co-analgesics may be required for successful treatment. The added knowledge of non-pharmacological options may help prevent chronicity of non-specific pain within a bio psychosocial model.*

1.3.2.1 Pharmacological pain management

1.3.2.1.1 Opioids

The students are to know that opioids are essential components of an analgesic regime for post-operative and cancer pain. They may also form part of an analgesic regime for neuropathic pain, but only rarely for chronic non-specific pain syndromes (e.g. headaches or back pain).

The students are to know the pharmacodynamics of opioids:

- their sites of action: supraspinal, spinal, and peripheral; increased expression of opioid receptors in inflamed tissue (clinical application: topical opioids),
- the classification of opioids based on specific receptor affinities (μ-receptor agonists, partial antagonists, antagonists),
- their analgesic and comparative potency (clinical application: tables of equivalent doses).

The students are to know the pharmacokinetics of opioids:

- standard and delayed-release opioid formulations,
- onset of action: significant delay with transdermal opioid application,
- bio-availability: assessment of the dose calculation for oral and parenteral application,
- half-life: calculation of dosage intervals,
- drug metabolism: hepatic or renal impairment carries the risks of accumulation.

The students should know the various forms of application (oral, oral trans mucosal, intranasal, transdermal, intravenous, epidural, intraarticular, topical) and their different indications, in particular, the principle of giving preference to non-invasive forms of application (with the exception of acute pain of high intensity). The use of epidural techniques is considered only when prolonged and intolerable side effects of systemic pain treatment are experienced. Transdermal forms of application are suitable for the conditions of dysphagia and ileus, and when compliance problems exist. They are, however, not suitable for the treatment of acute pain.

The students should know that

- "weak" and "strong" opioids are only distinguished by their individual maximum analgesic efficacy (three types of opioids have to be known),
- the selection of opioids is generally based on their individual tolerability and that acquired tolerance is rare.

The students are to be aware of the advantages of opioids and are to be able to communicate these advantages in discussions with the patient:

- opioids are not toxic to organs, even in high doses and with long term application, and have no teratogenic side effects,
- if required, opioid dose increases are possible (exceptions with dose limitations are: tilidine/naloxone, tramadol, buprenorphine, pentazocine),
- respiratory depression is rare, is almost always due to drug dosage errors, and can be prevented by dose titration,
- without evidence of previous drug abuse, treatment with opioids only occasionally leads to addiction. Psychological dependence (addiction) describes uncontrolled opioid intake with the aim of achieving a euphoric state or relief of anxiety. "Yellow flags": e.g. dose escalation without previous discussion, concurrent prescriptions by various physicians.

The students should also know the disadvantages of opioids and should be able to communicate these to the patient:

- opioids may cause habituation or physical dependence, and their dosage has to be reduced incrementally after a long-term intake (> three weeks) in order to prevent withdrawal symptoms (restlessness, disorientation, hallucinations, tachycardia, hypertonia, diarrhoea, excessive sweating),
- constipation occurs frequently (acquired tolerance does not develop) and usually requires prophylactic and continual treatment with laxatives,
- nausea and vomiting occur frequently (acquired tolerance develops within one week) and usually requires a temporary prophylactic administration of antiemetic,
- sedation occurs frequently (acquired tolerance develops within one week),
- delirium and myoclonus occur rarely (acquired tolerance does not develop) and these symptoms require a change of opioids, similarly for lasting nausea and/or sedation.
- endocrine disturbances can occur with long term usage, including loss of sexual characteristics, and endocrine function requires monitoring on a regular basis.
- opioid hyperalgesia may occur, especially with high doses, which might require rotation to a different opioid and or a reduction to a lower dose equivalent.
- diversion may occur.
  addiction may occur
- there is a significant mortality rate in the community (especially in North America) from opioids given for non-malignant pain, and all patients on long term therapy should be monitored regularly and carefully by the same practitioner.

1.3.2.1.2 Non-opioid analgesics (non-steroidal anti-inflammatory drugs (NSAIDs), "everyday analgesics", over-the-counter analgesics for musculoskeletal pain)

The students should know the following about NSAIDs:

- their value within analgesic regimes (as an element of the "pain ladder" for post-operative and cancer pain),
- their mechanisms of action (inhibition of cyclooxygenase (COX) isoenzymes, functioning as prostaglandin inhibitors and reducing peripheral as well as central sensitization; selective inhibition of COX1 or COX2) and the advantages and disadvantages of different active ingredients,
- the risk of ulcers with the complication of gastrointestinal haemorrhage particularly in the following circumstances: long-term application > 10 days, age of patient > 75, co-administration with steroids, high therapeutic dosages, previous history of ulcers, alcohol abuse, anorexia, high co-morbidity, female sex),
- other typical adverse effects (kidney function disorders, water retention, heart failure, hypertension and thromboembolic effects, arterial hypertension with long-term use, acute bronchoconstriction),
- the particular features of acetylsalicylic acid (increased risk of bleeding for days) and paracetamol (liver damage),
- the contra-indications and pharmacokinetic properties of the most important active agents (acetylsalicylic acid, diclofenac, ibuprofen, naproxen, paracetamol),
- the use of more tolerable long-term alternatives: metamizole or paracetamol (weak cyclooxygenase inhibitors).

1.3.2.1.3 Co-analgesics

The students are to know that co-analgesics are drugs that are not classified as analgesics but that can, for certain indications, be used for treating pain. The following treatment rules should be understood:

- co-analgesics are sometimes better suited for treating neuropathic pain than opioids,
- the selection of co-analgesics is dependent on the quality of pain and the psychological co-morbidity,
- synergistic effects with opioids can occur,
- strong variability in efficacy exists and changes of co-analgesics are therefore justified,
- a slow titration of dose prevents undesired effects,
- the drug is only considered sufficiently trialled if an adequate dose is attained over a longer period,
- intolerable side-effects require a change to a different substance.

The students should be able to detail the features of two classes of co-analgesics, i.e.:

- tricyclic antidepressants (indication: neuropathic pain; mechanism of action: reuptake inhibition of noradrenaline and serotonin; side effects: cardiac conduction abnormalities, orthostatic hypotension, dry mouth, increased appetite, weight gain, sedation, constipation, difficulty with micturition, triggering of acute glaucoma),
- anticonvulsants (indication: neuropathic-neuralgic pain and burning dysthesias; mechanism of action: reduction of hyper excitability and paroxysmal electrical discharging of sensitised peripheral and central neurons, blockage of voltage-dependent sodium channels (e.g. phenytoin and carbamazepine), GABA-ergic effects (e.g. benzodiazepines and barbiturates), inhibition of voltage-dependent calcium channels (e.g. gabapentin and pregabalin); side effects: vertigo, sedation, liver toxicity, blood dyscrasias, hyponatraemia).

Other less frequently used co-analgesics include corticosteroids, ketamine, bisphosphonates, calcitonin, cannabidiol, and botulinum toxin.

1.3.2.2 Non-pharmacological pain management

The students should know three of the following therapies used in non-pharmacological pain treatment:

- active exercise-based physiotherapy to improve physical condition (active treatments are always preferred to passive treatments for chronic pain),
- manual therapy: a treatment technique aiming at analyzing functional disorders of the musculoskeletal system and concurrent mobilization (parallel relief and training),
- application of heat (thermotherapy) for the relaxation of tight muscles (non evidence based),
- electrotherapy: application of currents of varying frequencies (non evidence based),
- acupuncture (recommended for the following: arthritis, chronic non-specific back pain and headache).

The students are to know about available relaxation methods and their principles and applications, understand them within a psycho-biological stress model, and recognize that chronic pain is a physical stressor for the body.

The students are to know the general therapeutic principles of relaxation techniques:

- physiological: decrease in heart rate, blood pressure, respiratory rate, muscle tone, and activity of the sweat glands, and prevention of positive feedback of pain and stress,
- psychological/cognitive: calmness and well-being, increased self-efficacy enabling independent active intervention in the "pain-stress" cycle; improved body experience in situations of elevated anxiety and muscular tension; improved handling of stress by transferring the learned relaxation into a daily routine.

The students are to be able to name the following three relaxation techniques and to know the operating principles of at least one:

- Biofeedback; methods: reading of physiological parameters such as electro dermal activity, muscle tension or heart rate and simultaneous feedback of acoustic and/or visual signals to the patient; potential mechanisms of action: change of a specific pathophysiological dysfunction, develop competent techniques of specific and/or general relaxation, improvement in self-efficacy, improvement of interoception = self-perception,
- Progressive muscle relaxation (PMR) after Jacobson; methods: gradual tightening and subsequent deliberate loosening of muscles; potential mechanisms of action: regulation of the autonomic nervous system, moderation of emotional and physical stress reactions; aims and benefits: improvement of body perception regarding sites of tension and the capability to independently affect those, deflection of focus to non-painful body parts, reduction of the pain experience,
- Autogenic training (AT) after Schultz; methods: gradual learning of creating sensations such as warmth, heaviness, calmness, and coolness of the forehead through suggestive self-instruction; potential mechanisms of action: same as for PMR after Jacobson.

1.3.2.3 Invasive treatments

The students should be aware of interventional and invasive method s of pain treatment using epidural and plexus catheters as well as nerve blocks and destructive neurolysis. They are to know that interventional pain management:

- is generally useful for cancer or post-operative pain after non-invasive treatments have been exhausted, and, in particular, in the case of intolerable undesired effects of systemic pain management,
- includes a range of diagnostic blocks and treatments including injections, drug delivery systems and neurostimulation which have fair to good evidence bases,
- can involve risks which can be minimised with adequate training of skilled personnel,
- can be used by pain clinic therapists with variable degrees of success in chronic non-malignant pain
- can reinforce the chronicity of chronic non-cancer pain with psychological co-morbidity and therefore should only be considered following an interdisciplinary case presentation (e.g. within the framework of a multidisciplinary pain team),
- ongoing research should clarify the exact place and appropriate clinical usage in chronic pain

1.3.3 Patient Education

Patient education is an important element of the treatment of pain.

For successful pain treatment, patients require a transparent treatment plan which needs to set realistic goals and involves a detailed discussion of potential untoward effects.

The students should understand that adequate patient education is an essential condition for achieving patient compliance and the overall success of treatment. They therefore have to be able to communicate during the consultation the information regarding the cause of pain, the suggested treatment, and its alternatives.

The students must name at least three of the following essential elements of the physician-patient dialogue, in the context of persistent pain:

- no promises of "freedom of pain",
- the formulation of realistic treatment goals after eliciting the patient's expectations,
- clarification of the effects and side-effects of a treatment and its possible alternatives,
- prevention of common side effects,
- a written treatment plan.

1.3.4 Pain Management Programmes

Rehabilitation and physical treatments (back school, functional restoration programmes, and others) can be helpful, but where more complex situations exist, the psychological components of pain are best addressed in a pain management program.

Based on cognitive behavioural principles, pain management programs are suitable for people for persistent pain where normal evidence based therapies have failed, and where there is insignificant adverse effect on quality of life, function or mood. The program consists of education on pain physiology, psychology, healthy function and self management of pain problems; goals are set, and worked towards; unhelpful beliefs and behaviours are challenged and modified; relaxation and coping skills are taught.
Treatment is delivered as a package by a multidisciplinary team where some competencies are shared and some are unique to a particular profession. They are delivered in a group format to normalise pain experience and to maximise learning from other group members. There is good evidence of improving mood, coping, function, and reducing pain and negative outlooks after attendance. Return to work can be achieved by some suitably tailored pain management programs.

2 Acute pain: post-operative and post-traumatic pain

Post-operative and post-traumatic pain is acute pain which is generally short-term, and persists for a few days or weeks only.

In contrast to most forms of chronic pain, acute pain provides a warning function for the human organism. If pain continues without normal resolution, it may develop characteristics of a chronic pain syndrome. Tissue trauma and pain stimulate nociceptors and activate the sympathetic nervous system. An important treatment goal, in addition to the relief of pain, is the reduction of this stress response to surgery or trauma. Post-operative and post-traumatic pain increases patient morbidity and consequently the length of hospital stay. Treatment of pain is therefore important and relatively safe, without frequent complications. The relief of pain and the resulting increased comfort of the patient are important ethical goals. On the physical level, the reduction of sympathetic system activation and subsequent post-operative stress syndrome results in a decrease of morbidity and possibly also mortality. In addition to the prevention of pain chronicity, the physician's responsibility to provide adequate pain management *is also of significance.*

The students should know the characteristics of acute pain (potentially life-sustaining function, warning function, protection through immobilization, and decrease in pain intensity over time, straightforward psychological processing, and a wide social acceptance) as well as the symptoms of acute pain and should be able to distinguish these from those of chronic pain.

The students are to know the following pathophysiological aspects of acute post-operative and post-traumatic pain and are to be able to relate them to the various organ systems:

- sympathetic adrenergic system: stimulation (increased total oxygen demand/uptake by the body, reduced microcirculation),

- cardiovascular system: tachycardia, hypertension, increased myocardial oxygen demand, higher incidence of myocardial ischemia,
- respiratory system: pain-induced hypoventilation, atelectasis, risk of pneunomia,
- gastrointestinal tract: gastric atony, paralytic ileus and suture breakdown,
- generalized: sympathetic adrenergic stimulation with reduced microcirculation, hyperglycaemia, pain-induced immobilization, delayed enteral feeding, delayed rehabilitation, and increased rates of thrombo-embolism.

The students should understand that post-operative and post-traumatic pain treatment helps achieve organ protection by a reduction in myocardial and total oxygen demand of the body, an improvement in respiratory effort, breathing mechanics and lung function, and acceleration in wound healing. These processes allow earlier mobilization and early enteral feeding, which in consequence can lead to a decrease of post-operative morbidity and mortality.

The students are to be competent in the principles of acute pain management:

- measurement of pain intensity with the help of a numerical rating scale ranging from 0-10 (NRS with 0 = no pain and 10 = worst pain imaginable),
- methods of administration: oral before parenteral before epidural; exceptions: immediate IV administration for severe pain (pain emergency) or IV/s.c. administration when oral route is not possible (vomiting, gastrointestinal dysfunction, immediately post-operatively); intramuscular administration is obsolete,
- first-line analgesia: continuous analgesia at regular fixed intervals, with a preference for slow-release formulations or alternatively patient controlled analgesia (PCA),
- on-demand analgesia (= rescue medication): supplementary to first-line treatment, with a fixed safety gap prior to administration of further medication (e.g. 30 minutes for oral administration and 10 minutes for patient controlled intravenous administration of tramadol),
- a combination of various analgesics (following the WHO Pain Relief Ladder for cancer pain; see section 3.2) and appropriate for the expected pain intensity,
- monitoring of pain relief, and, if necessary, adjustment of standard analgesia depending on, e.g. bolus frequency,
- the control and treatment of (opioid) side-effects (in particular, anti-emetic prophylaxis).

The pain intensity must be continuously recorded during the post-operative or post-traumatic period. Here, functional parameters (pain at rest or on movement) and pain-related changes during sleep, breathing therapy, or mobilization need to be taken into account. The students must know at least two indications of the success of treatment.

The students should give an example of a graduated oral analgesic regimen, depending on expected pain intensity:

- dosage and administration intervals for first-line analgesia and on-demand medication,
- selection of appropriate medications according to local requirements,
- criteria for the step-wise transition within the analgesic regimen,
- exit criteria for the analgesic regimen.

Example of Level I: procedures with expected mild pain
Non-opioid; additional low-efficacy opioid for NRS > 3; if this is needed twice in the course of 8 hours - transition to Grade II; notification of the physician for NRS > 7.

Example of Level II: procedures with expected moderate pain
Non-opioid and low-efficacy opioid; additional high-efficacy opioid for NRS > 3; if this is needed twice in the course of 8 hours transition to Grade III; notification of the physician for NRS > 7.

Example of Level III: procedures with expected severe pain
High-potency opioid (slow-release) plus high-efficacy opioid (immediate release) as on-demand medication; notification of the physician for NRS > 7.

Example of Level IV: procedures with expected severe pain in patients at increased risk of morbidity
Advanced methods of administration (PCA = patient-controlled analgesia, catheter procedures).

The students must know how to treat a pain emergency (NRS > 7). Parenteral application should be preferred due to its rapid onset of effect, depending on the considered urgency. The titration of opioid analgesia prevents undesired effects of overdosing, such as sedation and respiratory depression.

The students should know that sedation, the cardiovascular system, and respiration must be monitored, in particular when opioids are repetitively administered. They have to know the treatment for a (relative) opioid overdose (airway and breathing support administration of oxygen, using titrated IV opioid antagonists (naloxone), and subsequent monitoring in intensive care).

The students should know two techniques of advanced post-operative pain treatment, e.g. regional anaesthesia (low spinal or thoracic epidural) and intravenous patient-controlled analgesia (PCA), as well as their significance for major surgery, and for patients with increased perioperative risk.

3 Cancer pain

Cancer pain is pain that is directly or indirectly connected to malignancy.

Seventy to ninety percent of all cancer patients suffer from severe or very severe pain. For this reason, the treatment of pain must be of high priority to the physician, especially given that the majority of cancer patients (> 80%) can be effectively treated using the easily applied principles of the WHO (Cancer) Pain Relief Ladder. The prescription of opioids requires knowledge of the prescription regulations for opioids
The students must know the etiology of cancer pain: The compression of soft tissues and nerves by the tumour and by metastases, e.g. of the liver or the bones, possibly with pathological fractures, has to be identified. The following examples of cancer-related pain have to be considered: thromboembolism, herpes zoster due to immunosuppression, myofascial pain, and decubitus ulcer due to immobilization. Examples of therapy-related cancer pain are post-operative wound pain, mucositis after bone marrow transplantation, and neuropathy due to the toxicity of cytotoxics and radiotherapy. Examples of pain that are usually independent of the cancer are headaches, back pain, or pain due to injuries from a fall.

For the treatment of cancer pain, the students should be able to apply the WHO Pain Relief

Ladder: Step I involves the administration of non-opioid analgesics, Step II involves the continuation of the non-opioid analgesics with the addition of low-efficacy opioids, and Step III involves the replacement of the low-efficacy opioids by high-efficacy opioids. During all three stages, consideration must be given to indications for co-analgesics particularly if neuropathic pain is involved. The students should know that invasive or neurodestructive treatments should only be performed after failure of this WHO stepped approach. The students should also be able to provide examples of invasive and neurolytic procedures, such as celiac plexus blockade and epidural catheter analgesia.

The students are to know how to apply the national prescription regulations for opioids:

- application for opioid prescriptions at the national narcotics agency (e.g., with submission of medical licensure,
- proper completion of a narcotics prescription,

4 Neuropathic pain

Neuropathic pain caused by a primary disease or lesion of the nervous system.

For the classification of pain, the distinction between nociceptive and neuropathic pain is important. Often, a pain syndrome consists of both nociceptive and neuropathic components. The clinical picture frequently includes persistent burning pain, or attacks of stabbing in addition to evoked pain, such as hyperalgesia and allodynia. Conventional analgesics (non-opioids and opioids) frequently cannot control neuropathic pain sufficiently. Neuropathic pain requires specialised treatment plans tailored to individual situations. This kind of therapy is generally different to treatments for nociceptive pain.

The students should know that a careful history, including an evaluation of the pain quality - and a subsequent neurological examination, in particular an assessment of sensory function, can provide important clues to the type of pain and consequently the cause of the pain. The students are to know and understand terms such as allodynia (a painful response to a usually non-painful stimulus, e.g. by a cotton ball or a water jet) and hyperalgesia (an increased response to a painful stimulus, e.g. by a pinprick).

Precise localisation of the pain distribution and sensory resp. motor abnormalities also allows identification of specific peripheral nerve or nerve root (dermatomal) involvement.

The students should be able to name two typical illnesses that are associated with neuropathic pain and are to know their cause, symptomatology, and treatment (e.g. polyneuropathy, post-herpes zoster, stroke, multiple sclerosis and spinal injuries).

4.1 Example: polyneuropathy

The students should know that polyneuropathy is a generalized injury of several peripheral nerves by a systemic process with motor, sensory or autonomic symptoms. They have to be able to name the typical distribution pattern (i.e., stocking – or glove-like distribution) of polyneuropathy.

Two of the following possible causes have to be known:

- diabetes mellitus,
- toxic substances such as cytotoxic agents or alcohol,
- malignancy (paraneoplastic polyneuropathy),
- infectious/inflammatory causes (e.g. HIV).

The students are to know at least two classes of co-analgesics and two examples of each class. They should be aware that treatment with opioids is not the first choice and that other medication ought to be tried first (e.g. anticonvulsants, SNRIs and tricyclic antidepressants).

4.2 Example: herpes zoster

The students should know that herpes zoster is a neurotropic infection with the varicella-zoster virus and is caused by the reactivation of varicella viruses in the spinal ganglia. It occurs more frequently in patients with compromised immune systems (e.g. after radiation or chemotherapy) and with advanced age.

The students should recognize the symptoms below:

- mostly band-shaped, pustular exanthema affecting one side of the body,
- 50% thoracic; approx. 20% in the area innervated by the trigeminal nerve,
- in the area innervated by one or several spinal ganglia (in the area of one or several dermatomes),
- persistent pain (burning, stinging) with a high degree of tenderness (allodynia) and stabbing sensations.

The students are to know at least two classes of co-analgesics and two examples of each class. They are to know that treatment with opioids is not the first choice and that antiviral agents should be administered within the first 72 hours after the onset of symptoms. The students are to be aware that early and adequate treatment may reduce the incidence of persistent neuropathic pain.

5 Development of pain chronicity: distinction between acute and chronic pain

Pain that persists for longer than six months is considered chronic pain. In addition to this temporal difference, chronic pain also involves expansion beyond a purely physical experience to psychological and social realms.

Typically, chronic benign pain leads to an expansion of the symptom complex to include multiple sites and dimensions. Chronic pain has lost its warning function, and has to be considered its own disease entity. Treating chronic pain according to the principles of acute pain management *is generally not successful. The signs of the development of chronicity therefore need to be recognized at an early stage in order to initiate an appropriate treatment plan, preventing further chronicity. It should be carried out in specialized centres following a multimodal therapeutic approach based on the findings of a multidimensional bio psychosocial disease model.*

The students are to know two examples of chronic pain conditions, e.g. non-specific chronic back pain and headache due to overuse of medication.

5.1 Example: chronic, non-specific back pain

The students must be aware of the incidence, prevalence, and socio-economic significance of back pain: an incidence rate of 80% for back pain of which 10% is chronic; the high economic costs per year due to loss of productivity (40% of all absenteeism cases); 5 to 6 billion Euro costs for the national health insurances (in Germany: GKV – Gesetzliche Krankenversicherung). The etiology of back pain is not specific in more than 90% of all cases. Specific back pain has to be defined in a differential diagnosis (cancer, inflammation/abscess, herniated disk, instability, fracture). Degenerative changes following osteochondrosis, spondylarthrosis, and changes of the disk that are not hernia-related are frequently associated with non-specific back pain but can usually not be attributed as the cause.

The students are to be able to recognize the following "red flags" in patients with back pain:

- age > 50,
- fever, unexplained increase in ESR (erythrocyte sedimentation rate), increase in C-reactive protein, leukocytosis or anemia,
- weight loss,
- history of malignancy,
- bony destruction, especially bone metastases
- neurological symptoms or signs

The presence of "red flags" requires a prompt, specific, and comprehensive diagnostic investigation.

In addition, the students are to be able to recognize at least three of the following "yellow flags" indicating the likely development of chronicity:

- constant pain without variability of intensity or symptoms,
- fear of movement and activity (fear-avoidant behaviour),
- difficulties in the work environment,
- catastrophisation,
- fixation on a physical/bodily cause for the pain,
- retirement/pension claims,
- inappropriate idealisation or deprecation of healthcare attendants.

The students are to know the principles of diagnosis, namely that

- discrepancies between the findings and the symptoms are common, e.g. the extent of morphological changes on imaging do not correlate with the symptoms,
- special diagnostic investigations (and therapies) have to be introduced in the absence of "red flags" if the symptoms persist for more than 3 to 6 months and/or result in incapacity to work for more than 3 to 6 weeks.

The students are to know the building blocks of a multimodal pain management concept which combines therapeutic approaches from various disciplines, in order to promote health rather than focusing on disease:

- considered use of medications (analgesics/co-analgesics) aiming at minimal or no analgesic intake,
- active exercise-based physiotherapy,
- use of warmth and cold,
- patient education,
- evaluation and promotion of pain coping strategies,
- relaxation techniques,
- psychotherapy for pain, e.g. behaviour therapy focusing on creating an emotional distance to the pain,
- transcutaneous electrical nerve stimulation (TENS) and acupuncture.

The students are to know that interventions are usually not indicated in the treatment of back pain. Interventional procedures (local infiltrations or infiltrations of nerve roots or facet joints) have risks associated with the intervention itself and may also enforce chronicity. In addition, the students must know that there is no evidence for the long-term efficacy of opioids for non-specific back pain. The students should also know that the treatment of non-specific back pain with early signs of chronicity should only be carried out in designated specialist centres or programs.

The students should be able to name at least three of the following therapeutic goals:

- reduction of pain, not absence of pain,
- changes in pain experience,
- acquisition of active coping strategies,
- improvement in quality of life,
- return to the work place,
- reduced medication and utilization of the health care system.

5.2 Example: headache due to overuse of medication

The students should know that a headache due to the overuse of medication (medication-induced headache (MIH)) is the result of an inadequate treatment of the primary headache disorder. The students are to know the two main types of headaches that lead to an overuse of medication, namely migraine and tension headache. At least two examples of the following substance classes should be known: caffeinated mixed preparations of analgesics, triptans, ergotamine, non-steroidal anti-inflammatories. The students are to be aware that daily doses are not relevant for the development of medication-induced headaches. The frequency of intake however is relevant, i.e. beginning at 10/month for triptans and at 15/month for non-steroidal anti-inflammatories and antipyretics. The students are to know that a relevant diagnosis of the underlying headache can only be made after withdrawing treatment.

In addition, the following symptoms of medication-induced headaches must be known: persistent headache (with or without migraine attacks) or an accumulation of migraine attacks without persistent headache.

The students must also know the treatment of medication-induced headaches: withdrawal of the medication with accompanying physical and behavioural therapy, followed by a symptom-relevant treatment of the primary headache disorder. The students should understand that opioids are only indicated for secondary headache disorders such as cerebral metastasis.

6 Specific therapeutic populations and challenges

Pain management for children, elderly patients, pregnant and breastfeeding women and for patients with opioid addiction and dependence

The treatment of pain in children or in patients with dementia requires particular vigilance and specific techniques. Communication deficits can lead to an inaccurate assessment and consequently to inadequate treatment of the pain. In addition, altered analgesic pharmacokinetics in the very young or elderly have to be taken into account in order to prevent over- or underdosis. For pregnant and breastfeeding women, toxicity risks need to be carefully considered when considering the use of different analgesics.

6.1 Children

The students must know that the physician's responsibility to provide adequate pain relief also applies to children, toddlers, and infants. They are to be aware of the increased pain sensitivity of premature infants and the newborn, and of the possible lifelong consequences following sensitization mechanisms if pain treatment is inadequate.
The students should be able to apply the basic pain assessment tools relevant to the newborn, infants, and children:

- signs of sympathetic/adrenergic stimulation: bradycardia, tachycardia, bradypnea, tachypnea, changes of blood pressure, or SaO2,
- pain vocalization: screaming, crying, whimpering,
- grimacing: contracted eyebrows, wrinkled forehead with vertical crease, narrow eyes, distinct nasolabial fold, drawn labial angle,
- motor and sensory function: posture, withdrawal movements, kicking movements, changes of tone, altered perception of touch,
- vegetative changes: sweating, sleep disorders, feeding disorders.

The students are to know other assessment tools that are based on age group and should know at least one example, e.g. the Smiley scale or pediatric pain scales (in Germany: KUSS - Kindliche Unbehagens- und Schmerz-Skala).

The students are to know the five most important analgesics used in paediatrics (paracetamol, ibuprofen/diclofenac, metamizole, tramadol and morphine), their indication, application principles, and side effects (dosage based on body weight, age-group related choice of agent, the indications for different routes of administration, maximum daily doses), and are to be aware of the particular risks of acetylsalicylic acid in children. They are to be aware of the problems related to pharmaceutical drug registration in paediatrics (off-label use).

The students should be aware that non-pharmacological pain management is also possible for children.

6.2 Old age and dementia

The students should know that the physician's responsibility to provide adequate pain relief

also applies to patients of advanced age and patients with dementia, and those elderly pain patients are often undertreated. They are to be aware of the underlying reasons for inadequate treatment, e.g. communication barriers, lack of knowledge regarding the use of medication in old age and of the pain sensitivity of dementia patients. The students must understand the key aspects of the epidemiology of pain in old age, e.g. equal acute pain prevalence, increase in persistent pain until the seventh decade, in particular due to neuropathic pain and diseases of the musculoskeletal system.

The students are to know the important age-related aspects of the nociceptive system (e.g., increases or decreases of receptor density) as well as of central pain processing (e.g., unchanged affective component). They should understand that older pain patients have distinct age-related attitudes and coping styles, e.g. stoicism. They are to be aware of the significance and incidence of psychological co-morbidity in old age, in particular of depression.

The students are to be aware of the usefulness of analogue scales for pain in old age despite limited cognitive ability. They should recognize potential indicators for pain in patients of old age without the ability to communicate, e.g. moaning, unrest, confusion, altered movement patterns, and facial expressions. The students need to know the principles of external observation scales and their significance for old-age and dementia patients.

The students are to know the essential aspects relevant to the choice of analgesics for the elderly. They need to be aware of the reduced hepatic metabolism and renal clearance in the elderly. The students are also to be aware of the significance and risks of co-morbidity and polypharmacy, common in this age group. They should be able to name the more frequent risks (e.g. opioid-related falls) and undesired effects (e.g. opioid-induced confusion) of analgesic therapy.

The students should understand that non-pharmacological pain management and behaviour therapy are also possible for old-age patients.

6.3 Pregnancy and breastfeeding

The students must know the most important aspects of the treatment of acute and chronic pain during pregnancy and breastfeeding, e.g. special risks of analgesia for mother and child, the restriction of medication during pregnancy and breastfeeding and the lack of scientific evidence for drug safety.

The students must know the common risks of frequently-used analgesics for the foetus and newborn, e.g. withdrawal syndromes and respiratory depression in newborn following opioid use during pregnancy; premature closure of the ductus arteriosus due to the use of non-steroidal anti-inflammatory drugs (NSAIDs) during the last trimester; transfer of medication into the breast milk. The students must know the appropriate procedures (e.g. epidural analgesia) and analgesics (e.g. meperidine or paracetamol) for intra-partum pain management.

The students are to know the specific risks for chronically ill women (e.g. with migraine or post-traumatic-neuropathic pain) who might become pregnant, in particular the teratogenicity of typical co-analgesics (frequent structural deformities) and the withdrawal risk of a long-term opioid analgesia for the newborn.

In this context, they should name the important risks of treatment, such as the risk of deformity due to anticonvulsants, e.g. carbamazepine, and the risk of opioid withdrawal in the newborn after opioid treatment during pregnancy. These risks necessitate a careful evaluation of long-term medication for women with the desire to have children.

6.4 Addiction and dependence

Patients with a history of drug abuse have to be identified and require special precautions. A balanced approach implies that a) students will recognize the importance of reducing abuse, addiction and diversion and will acquire the knowledge and skills necessary to collaborate in this and that b) regulators acknowledge the essential role of (opioid) drugs and will do nothing that undermines their appropriate medical use.

Students should know, that

- dependence is defined as a state of adaptation characterized by a class specific drug withdrawal syndrome, which can be produced, e.g., by abrupt cessation, rapid dose reduction or administration of an antagonist. It is a predictable drug affect and can be avoided by stepwise dose tapering,
- drug abuse should apply to the use of any drug, that is outside of accepted norms. It labels any use of an illicit drug and any misuse of a prescribed drug as abuse,
- addiction is a primary, chronic, neurobiological disease with genetic, psychosocial and environmental factors influencing its development and manifestations. It is characterized by behaviours, that include impaired control over drug use, compulsive use, continued use despite harm.

Students should know specific predictors of problematic drug use,which include

- prior history of substance abuse (e.g., alcohol or benzodiazepines),
- need to increase the dose without obvious reason,
- preference for a specific route,
- focus on the drug during visits and prescription problems

Finally, students should know how to avoid drug abuse: all patients should be screened for prior drug abuse, explicit instructions on use of drugs should be delivered in patient education and repetitive monitoring of adequate drug use should be undertaken.

Further information is available from:

EFIC®
Grensstraat 7, mailbox 3
1831 Diegem, Belgium
Phone: 00 32 2 251 55 10
Fax: 00 32 2 251 48 10
Email: secretary@efic.org