Despite the high prevalence, low back pain (LBP) remains poorly understood and inadequately treated. Prospective longitudinal studies have shown that up to 35% of the patients with acute low back pain will develop recurrent or chronic pain [e.g. 2]. A number of prospective studies revealed that the transition from acute to chronic pain was best predicted by a combination of biomedical, psychological, and social factors with the highest percentage of explained variance for psychological variables [5]. In a metaanalytic review, [7] analyzed 37 well-controlled prospective studies and came to the same conclusion about the role of psychological variables in the process of chronicity of back pain. International guidelines for the treatment in acute LBP patients [17] ask for the assessment of so-called “yellow flags” during the first 2 – 6 weeks of pain onset. If there are no so-called “red flags” (physical risk factors: tumors, fracture, etc) the physician should assess the yellow flags. Among others, Linton & Halden [6] published a first screening instrument that allows the identification of the psychosocial risk of chronification in patients with acute low back pain. Research of our group led to the differentiation between different modes of psychosocial risk factors: an anxious and depressive pain-related mood, combined with increased avoidance behavior and modes of pain-related suppression that encompasses thoughts of suppression as well as depressive behavior. Patients with a depressive coping mode try to finish all activities they have started in spite of severe pain [4].

In this study, we try to predict the pain intensity in LBP patients six months after hospitalization using the Avoidance-Endurance-Modell of chronic pain.

METHODS. With respect to economic testing, we developed a computerized system for the yellow flag assessment (tpdsSPR) that is easily applicable by physicians and therapists [3]. For testing the precision of the instrument, a sample of 71 acute LBP and leg pain patients was examined. Among other variables, the pain intensity at the beginning of hospitalization and 6 months later was measured. Also the Beck Depression Inventory (BDI, [1]) and the Kieler Pain Inventory (KPI, [5]) were assessed at the beginning of hospitalization. The patients were treated conservatively or by surgery. In order to predict the patients’ binary coded pain intensity 6 months after hospitalization a multilayer perceptron (MLP) was used. A MLP is a special kind of Artificial neural network (ANN) and often shown to be more powerful in classification tasks then alternative statistic procedures (e.g. [5]). Fig. 1 shows the ANN’s architecture used to predict the pain intensity in patients with low back pain 6 months after hospitalization.

RESULTS. The pain intensity 6 month after hospitalization was classified correctly in 83.1% of the patients. The sensitivity was 73% and the specificity 97%.

The Fig. 2 gives two examples for the predictions of the MLP. The Fig. 2a shows the colored coded output of the MLP assuming a patient’s depression of BDI=0 and the Fig. 2b assumes the depression would be BDI=8. If the output neuron of the MLP is less than .5 it indicates no pain intensity 6 months after hospitalization, greater values show significant pain intensity (chronic pain).

The comparison of Fig. 2a and Fig. 2b reveals larger areas of chronic pain if the depression is present during the acute epoch of pain. Further, we expect chronic pain under the condition of low “depression”, low “thoughts of suppression”, but high suppressive behavior at the initial testing. Vice versa, in the case of high “thoughts of suppression” and low depression we will expect there is no pain 6 months after hospitalization. If the depression is onset (Fig. 2b), the area of expected pain intensity is significant larger than without this onset. Additionally, the Fig. 2b shows a further area of expected pain in the case low suppressive behavior and low thoughts of suppression.

CONCLUSION. The results of the MLP indicated high specificity and sensitivity in long-term prediction of the chronicity in patients with acute LBP and leg pain. The onset of depression in patients with acute low back pain seems to be one of the main risk factors of chronicity. In some cases, high depression scores were associated with low scores in suppressive behavior and thoughts of suppression. We assume that this combination of variables refers to pain-related fear-avoidance behavior, which has been identified as a high risk factor in many prospective studies (e.g. [7]). Furthermore, the results of the MLP showed the onset of thoughts of suppression as well as of suppressive behavior as a risk to develop chronicity. In cases, when high depression scores were associated with high suppressive thoughts or behavior, we assume the mode of depressive thought suppression. Otherwise, also the association of low depression scores with high behavioral suppression was identified as high psychosocial risk factors (e.g. [4]).