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Incorporating Biopsychosocial Characteristics into Personalized Healthcare: A Clinical Approach

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Patient 1 was a 27-year-old woman with psoriasis with increasing disease progression during the previous 2 years, recently also showing plaques on her hands and other visible body areas. She felt stigmatized when going out with her friends and insecure about herself, had developed feelings of tension and anger, and worried a lot about her future. She could not accept her illness and wanted to learn better ways to deal with her social insecurity. Moreover, she suffered regularly from high levels of itch and related scratching behavior, with limiting effects on her daily life such as concentration problems and insomnia, and finally worsening effects on her psoriasis. Consequently, she was motivated to learn how to reduce the itch and scratching behavior. Together with her psychotherapist, she decided to work first on treatment modules of coping with itch (physical functioning), followed by modules focusing on feelings of anxiety and emotional adjustment (psychological functioning) as well as on stigmatization and social insecurity (social functioning).

Patient 2 was a 52-year-old man who had been diagnosed with rheumatoid arthritis. He felt helpless in coping with the uncertainty associated with disease fluctuations in the planning of his (work) activities. Partly due to disease fluctuations, he had a highly varying rest-activity pattern and suffered from severe fatigue during most days. As a consequence, he had had to quit his job and had become more and more depressed. He found it particularly difficult to feel dependent on others and had increasing communication problems in the relationship with his wife and children. Together with his psychotherapist, he decided to work first on treatment modules of coping with fatigue (physical functioning), followed by modules focusing on feelings of helplessness and depressed mood (psychological functioning) as well as on relationships with significant others and on social support (social functioning).

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The Clinical Problem

Chronic somatic conditions such as chronic pain, diabetes, multiple sclerosis or skin diseases are increasingly prevalent as people reach higher ages and due to improved medical treatment of previously life-threatening diseases. Currently, almost half of all adults are at some point in their lives confronted with one or more chronic somatic condition(s), which has many consequences for both patients and their environment, such as uncertainty, anxiety, adaptation in work and social relationships, and a changed future perspective [1, 2].

The way in which patients cope with somatic conditions affects their long-term physical and/or psychological outcome [1, 3, 4]. Many patients are capable of psychologically adjusting to their chronic condition, with minimal support and education; they achieve what is termed 'allostasis' (stability through change) [5]. However, about 30% of patients have clinically relevant levels of distress or deal with the stress inefficiently (allostatic overload), leading to adjustment problems that require some forms of psychosocial support, such as depressive symptoms or problems about coping with pain or fatigue. By means of treatments aimed at self-management and related psychotherapeutic approaches, these adjustment problems can be prevented or solved.

In the past decades, several psychological and psychopharmacological interventions have been introduced to improve the physical and psychological outcomes of patients with somatic conditions, with a growing focus on increasing the self-management capacities of patients [4, 6–9]. Although these approaches – usually based on evidence-based cognitive (e.g. cognitive restructuring), behavioral (e.g. graded activity) or physiological principles (e.g. serotonin-related pharmacological treatments) – have proven to positively affect adjustment in a variety of diseases, they are, on average, only modestly effective, and the effects are not, or only partly, maintained at follow-up. Also, high dropout rates and low treatment adherence are often reported [4, 6–9].

One of the problems is the large individual variability in treatment outcomes due to nonselection of patients – thus also including patients who are adjusting well on their own – and a lack of personalization of treatment to individual patient profiles [10–15]. Psychological and psychopharmacological treatments applied in psychological and somatic conditions usually consist of a general package consisting of multiple cognitive, behavioral and physiological modules, assuming that the different modules are to some extent relevant to and effective in all patients across and within conditions. As illustrated by the case vignettes, however, individual patients with somatic conditions show specific personalized needs that take into account the specific interaction between their physical, psychological and social problems, based on their particular disease, treatment trajectory and phase, as well as accompanying psychological comorbidity and stress and resilience factors [12, 16–18]. Consequently, a new, generally applicable framework for personalized treatment of patients with all kinds of somatic conditions is needed that is optimally tailored to the main physical, psychological or social problems and their interactions by combining state-of-the-art knowledge in different areas of psychotherapy (prediction, screening and treatment) [16, 19].

Therapeutic Strategies for Personalized Healthcare

Personalized healthcare refers to tailoring the diagnosis, management and treatment of each patient to his or her individual characteristics [19–22]. To date, personalized healthcare has focused mainly on identifying biological (e.g. genetic) markers that could predict the disease course, treatment response and risk of side effects, which could be used to select the regular treatment that most likely exerts beneficial physical effects and prevents adverse consequences for the individual patient [23, 24]. As to psychological treatments for patients with somatic conditions, biological markers for tailoring treatment strategies are not available, and consequently personalized healthcare needs to be defined more broadly. Approaches such as collaborative or person-centered care (e.g. shared decision-making for best treatment decisions, patients' priorities as a guiding principle to increase patients' motivation for lifestyle changes), increased self-management in managing a chronic condition (e.g. providing patients with problem-solving skills to enhance self-efficacy), sequential treatment (e.g. different targets of treatment during different treatment phases) and tailored treatment (e.g. specific treatment modules adapted to condition- and patient-specific psychological stress and resilience factors) reflect aspects of personalized healthcare in the field of psychotherapy. All those factors are increasingly recognized as important in the treatment of (somatic) conditions [17, 18, 25–27] and become more common in clinical practice and research [28–30]. In fact, by taking into account the large individual variability in disease outcome, psychological comorbidity, and psychological risk and resilience factors, more specialized

treatment may be offered to those most likely to benefit (e.g. patients with decreased self-management capacities), and specific treatment ingredients can be offered to patients based on their individual profiles. In addition, tailoring treatment to the individual patient and his/her condition-specific problems has partly been shown to increase treatment motivation, adherence and patient satisfaction and to decrease attrition rates [11, 15, 31] – and, most importantly, to increase treatment effectiveness [11, 12, 32–34], supporting an evidence-based framework for personalized healthcare that guides tailored treatment of patients with somatic conditions. This approach can be optimally realized by making use of evidence-based psychological treatment approaches to somatic conditions, and by focusing on patients' priorities with the physical, psychological and social problems (e.g. fatigue, depression and social dependence) most frequently experienced when adjusting to somatic conditions, while using multiple, evidence-based cognitive-behavioral techniques for an optimal personalized approach to every individual patient. Thus, offering specific physical, psychological or social treatment modules instead of a standard treatment package is considered a relevant next step in attaining a personalized healthcare framework in the area of psychological and psychopharmacological interventions and psychotherapy. Given the growing prevalence of somatic conditions combined with the limited number of specialized health professionals in this area (e.g. psychotherapists specialized in the treatment of patients with various somatic conditions), the cost-effectiveness of approaches to improving physical, psychological and social outcome in patients becomes increasingly relevant, not only to patients but also to society. However, although promising steps have been made, a coherent personalized healthcare framework for the psychological and psychopharmacological treatment of chronic somatic conditions in science, care and management beyond traditional diagnostics and treatments has not yet been developed [16]. This article for the first time combines current knowledge in psychotherapy about the prediction, screening and treatment of all kinds of chronic somatic conditions in order to introduce an innovative personalized healthcare approach based on generic principles aiming for tailored psychological interventions and psychotherapy for somatic conditions; this includes the following evidence-based steps:

(1) Identification of generic and condition-specific psychological risk and resilience factors in long-term physical, psychological and social functioning for a broad variety of patients with (chronic) somatic conditions.

(2) Use of validated (web-based) screening instruments to identify and select patients at risk with regard to their functioning and risk and resilience factors, as well as determination of patients' priorities in selecting treatment goals.

(3) Offering different personalized (web-based) psychological treatment options depending on the outcome of the screening and patient priorities, which include both generic and condition-specific modules for physical, psychological and social functioning, tailored to the condition- and patient-specific risk and resilience factors.

These three steps are described in more detail below.

Generic and Condition-Specific Risk and Resilience Factors in Long-Term Functioning

A prerequisite to developing a personalized healthcare approach is knowledge of possible risk and resilience factors for a broad variety of (chronic) somatic conditions. Most research on risk and resilience factors is based on stress-vulnerability models, which assume that the long-term functioning of an individual in response to an uncontrollable long-term stressor such as a somatic condition is primarily determined by internal vulnerability (e.g. neuroticism) or a lack of resilience (e.g. pessimism) and by external environmental factors (e.g. stressors). Stress-vulnerability models propose potential mediating factors for patients' functioning and disease outcome, such as psychological (e.g. cognitive, behavioral), social (e.g. social support) and physiological factors (autonomic, endocrine and immune function) [3, 16, 35–37]. However, these complex interactions between physical, psychological and social factors are hardly taken into account in the available (medical or psychological) treatment guidelines for these patient groups [16].

Current treatment approaches usually combine broad, generic treatment modules for which some evidence of benefit exists in specific populations. Studies indeed indicate that specific risk factors – such as excessive worrying and passive avoidance behavior, as in case vignettes 1 and 2, respectively – or resilience factors – such as expectations of positive outcome and perceived support, again as in case vignettes 1 and 2, respectively – are common to almost all somatic conditions [1, 2, 4, 13, 38] and are predictive of long-term physical, psychological and social functioning [39–42]. Although it is essential to know generic risk and resilience factors when developing effective treatments, the modest effects of most patient-generic programs may be partly attributable to the lack of knowledge about risk and resilience factors specific to a certain somatic condition. For instance, although nonindividual-

ized treatments handle anxiety as a generic symptom that can be treated in the same way in all patients, the specific condition-related fears and related anxiety problems – and, hence, the underlying mechanisms and treatment approaches – are mostly different for the specific somatic condition and ask for a more personalized approach (e.g. fear of being stigmatized in patients with a visible skin condition, as in case vignette 1; fear of inflammation and irreversible joint destruction in patients with rheumatoid arthritis, as in case vignette 2) [43]. Thus, a personalized healthcare framework includes knowledge of both the generic and the condition-specific risk and resilience factors that influence long-term disease outcome in order to select screening instruments and treatment modules tailored to specific risk profiles.

There is also some evidence that the stage of a disease influences the efficacy of a treatment. Early detection and modification of psychological risk and resilience factors is more likely to have long-term benefits and to decrease unfavorable long-term outcomes of somatic conditions, particularly if the treatment prevents irreversible long-term consequences such as joint destruction in patients with rheumatoid arthritis. In addition, patients are thought to develop a relatively stable strategy for coping with somatic conditions, and thus dysfunctional psychological factors may be less established and easier to modify at an earlier stage of the disease than later on [44, 45]. Studies of risk and resilience factors in various conditions have shown that these factors can be detected early, at the time of diagnosis, and that the most relevant risk and resilience factors have comparable relationships to outcomes regardless of disease stage [39, 46]. Retrospective analyses of previous trials of psychological treatments for various somatic conditions support the idea that the effectiveness of these psychological treatments is greater in patients with shorter disease duration [44, 47].

Use of (Web-Based) Screening Instruments to Select Patients at Risk

To assess patient functioning at a specific time point, reliable, valid and sensible (e.g. responsive to change) clinimetric assessment could provide insight into (1) the level of physical, psychological and social functioning in line with the main problems of somatic patients, (2) the presence of generic and condition-specific risk and resilience factors, and (3) the need for support or health priorities for the patient and his or her environment [48, 49]. Macro- and microanalyses of symptoms and related factors in combination offer psychotherapists tools for individualizing treatment priorities and goals for a specific patient at a specific time. The role of clinical reasoning and judgment is important in clinimetric assessment preceding treatment selection, permitting insight into hierarchical relationships between symptoms or complaints as well as allowing subtyping and differentiating diagnostic entities, staging of symptoms and incorporation of a previous treatment history within the personalized treatment recommendation [15, 17, 18]. Combined with a microanalysis of the onset, course, circumstances and consequences of specific symptoms, the psychotherapist obtains insight into functional relationships between co-occurring problems, not only focusing on symptoms but also on psychological and social aspects, providing insight into specific treatment targets at specific stages [17, 18].

By screening for a broad range of potential problems including physical (e.g. pain, fatigue), psychological (e.g. anxiety, depression) and social functioning (e.g. social support, stigmatization), insight is gained into the magnitude of adjustment problems and symptoms, which indicates treatment priorities and patient motivation [50]. Screening instruments for assessing the physical, psychological and social functioning of patients with chronic somatic conditions consequently include both generic and condition-related tools, such as the Hospital Anxiety and Depression Scale as a generic measure of general distress [51], and condition-specific measures of physical outcomes such as fatigue or itch [52–54]. Using such brief screening instruments for the two case vignettes described will provide insight into the severity of the anxiety and acceptance problems as well as of itch in case vignette 1 and of fatigue and depression in case vignette 2. In addition, screening for risk and resilience factors will provide clues as to where and how to intervene in a specific patient. These factors may be generic – such as excessive worrying (case vignette 1), lack of social support or illness cognitions (e.g. helplessness or acceptance; case vignettes 1 and 2) – as well as condition specific – such as fear of stigmatization for visible skin diseases (case vignette 1), fear of pain and disability in rheumatic diseases (case vignette 2) or fear of recurrence in breast cancer. A broad range of questionnaires could be used as screening instruments for assessing risk and resilience factors in chronic somatic conditions, including both generic and condition-related tools [55], such as the Penn State Worry Questionnaire to assess generic tendencies of worrying [56] and the Illness Cognition Questionnaire to measure frequently occurring illness cognitions in chronic somatic conditions [57].

Reliable and valid screening is a prerequisite for personalized healthcare approaches and can greatly increase their effectiveness – first, because screening of risk groups makes it possible that only those patients in need of help are offered treatment, thus preventing ceiling effects from toning down overall treatment effects, and second, because patients can be offered treatment ingredients or modules specifically tailored to their risk and resilience factors or problems of adjustment [12, 17, 32, 58]. Because the distinction between patients at risk and those not at risk is, by definition, arbitrary in continuous measures of screening instruments, brief screening instruments are generally used to make a first general selection, followed by more extensive and focused assessment to decide which patients might benefit from (which type of) treatment [17].

In regular care, clinimetric assessment can easily and cost-effectively be conducted by means of paper-and-pencil measures; these can be filled out by the majority of patients, regardless of characteristics such as age, and they do not require any computer experience or access. Nonetheless, substantial technological advances have augmented the possibilities of electronic assessment and (automated) feedback [59]. Ecologically valid information on daily functioning and disease burden can be obtained by means of personal digital assistants or smartphones that can provide automated feedback (e.g. advice on specific actions to be taken). To specifically enable personalized healthcare, patients can fill out brief screening questionnaires online at home before their consultation, which enables the clinician to monitor adjustments without necessarily seeing patients face to face, allowing a more focused consultation by providing feedback to the patient that is based on standardized databases (e.g. to initiate or motivate behavioral change) and by assessing the need of patients for additional psychological care. Feedback on a patient's functioning could be automated, for instance, by means of graphical patient profile charts which indicate in a visually clear and attractive way how patients are functioning in different areas, based on norm scores for that particular somatic condition or previous scores of the individual patient (see Peters et al. [53] and Vercoulen [54] for an example). Using such paper-and-pencil and/or web-based screening tools regularly (e.g. every 6 months) in standard care can significantly contribute to efficient and personalized patient care [54]. With regard to the two case vignettes, regular screening of the reported problem areas will provide insight into their response to treatment and long-term maintenance of treatment benefits or relapse indicating renewed need for treatment.

Offering (Web-Based) Personalized Treatment Options

Depending on the outcomes of screenings, different personalized treatment options consist of generic and condition-specific treatment modules that focus on the relevant condition- and patient-specific risk and resilience factors. For patients with various health conditions including cancer, chronic pain and skin diseases, an evidence-based, personalized healthcare approach has been successfully developed and applied [10, 11, 33, 60–62]. Figure 1 presents an overview of personalized treatment for somatic conditions [11] in which treatment consists of modules that target patients' most frequently reported problems, including physical functioning (e.g. coping with pain and functional disability, itch, fatigue, lifestyle adjustment), psychological functioning (e.g. anxiety and depressed mood, emotional adjustment) and social functioning (e.g. social support, stigmatization). The choice of treatment modules is determined on the basis of the screening instrument in conjunction with the patient's reported priorities and the therapist's judgment. In addition to the tailored module-based components, all treatments also include generic components such as goal-setting and long-term maintenance of achieved goals, as well as prevention of relapse at the end of treatment. The specific treatment modules in turn consist of evidence-based cognitive and behavioral techniques that are focused on specific risk and resilience factors with homework assignments. This treatment can be flexibly applied in every module (physical, psychological and social) with a broad variety of cognitive-behavioral strategies across several weeks or months to a variety of somatic conditions. As a consequence, even if two patients chose the same treatment modules, the treatment techniques and methods applied would vary widely, depending on the specific risk and resilience factors for every problem treated. With regard to the case vignettes, for example, treatment of patient 1 focused on coping with itch (physical), anxiety-related problems (psychological) and stigmatization (social), whereas treatment of patient 2 focused on coping with fatigue (physical), depressed mood (psychological) and social support (social). Besides these differences in treatment modules, the content of each module was adapted according to each patient's specific risk and resilience factors; thus, to patient 1, cognitive-behavioral techniques were applied to diminish worrying and increase acceptance, whereas, for patient 2, techniques for improving planning of (work) activities and decreasing helplessness were used.

Comparable personalized psychological healthcare approaches are currently applied and evaluated as E-

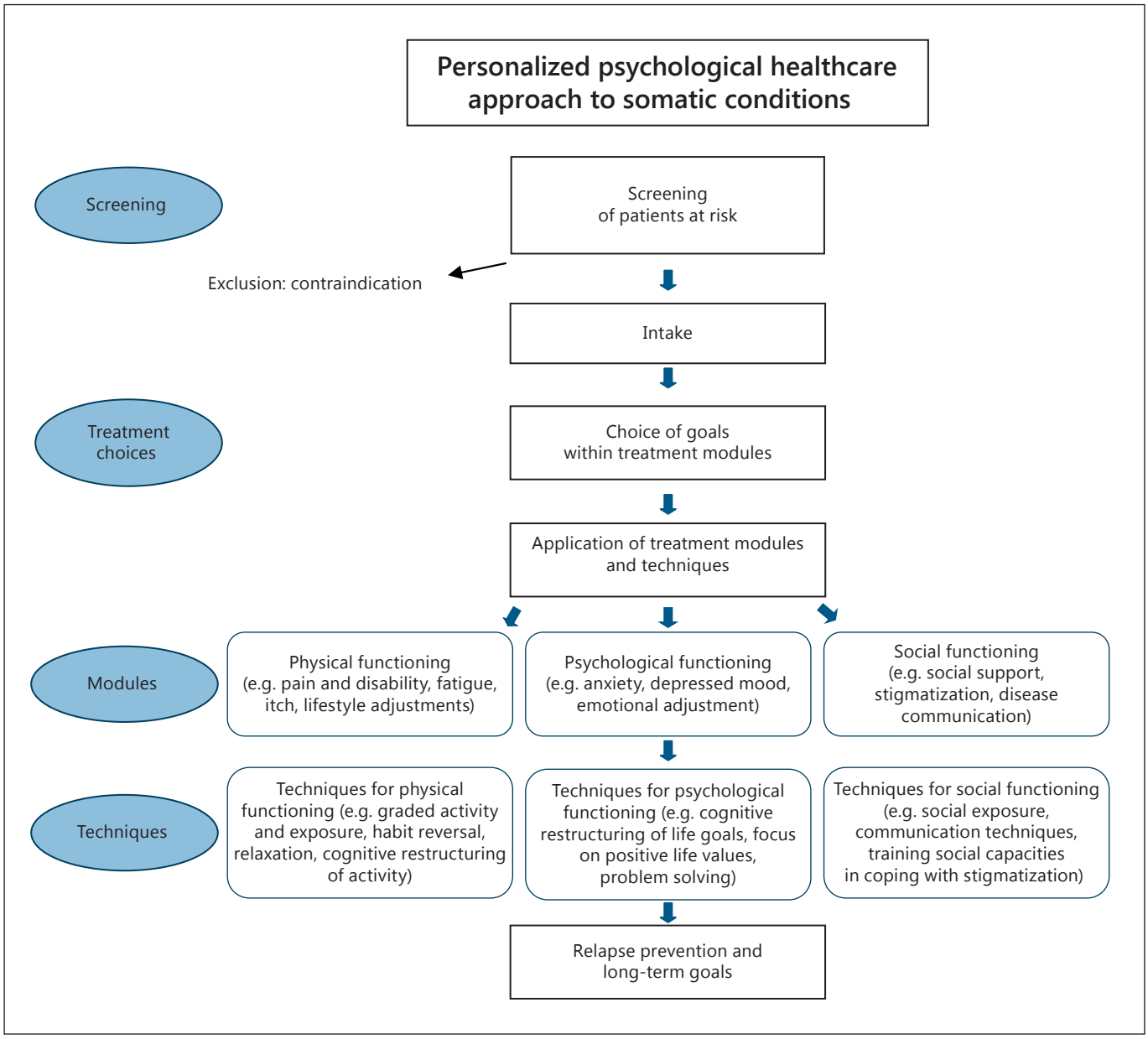

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Fig. 1. Schema of a personalized healthcare psychotherapeutic approach to somatic conditions.

health applications [63], which may have specific advantages for patients with chronic somatic conditions (e.g. not having to travel, immediate implementation in the home environment). Such web-based interventions, which have shown to be as effective as face-to-face interventions, are a highly promising area of development to reach this large and growing patient population in combination with a minimal therapist load [64–66].

Areas in Need of Research

Our previous outline showed that personalized healthcare for patients at risk of long-term adjustment problems holds promise for improving the (cost-)effectiveness of psychological and psychopharmacological interventions and psychotherapy for somatic conditions. Tailored treatment theoretically matches patients' needs and may increase patient satisfaction and compliance, and early

detection, diagnosis and treatment offers a better chance of decreasing unfavorable long-term disease outcomes. When incorporating validated screening tools and tailored treatment approaches into standard care provided by multidisciplinary teams, personalized treatment options might be a cost-effective way to deliver fitting healthcare to a large population by offering treatment at the level of need of the individual patient at a specific time [15]. This level of need could be assessed by means of regular screening for functioning and risk and resilience factors, with the outcome of this screening leading to a specific treatment recommendation. For example, around the time of diagnosis, all patients may be offered education about biomedical and psychological risk and resilience factors, whereas self-management training and tailored psychological therapy is offered to patients with a possible or definite at-risk psychological profile. Additionally, it would be highly interesting to study the interaction of cognitive-behavioral techniques with innovative pharmacological or neurobiological interventions, such as cognitive restructuring combined with transcranial magnetic stimulation to relieve severe depression [67]. Innovative approaches in this area further suggest that the simultaneous application of these techniques can result in vastly improved treatment effects (e.g. precortisol treatment during exposure in order to increase the coping capacity of an individual) [68, 69].

At this time, clinical implementation of efficacious personalized healthcare is frequently lacking in the psychotherapy domain, mainly due to a relative shortage of health professionals (e.g. psychotherapists specialized in treatment of somatic conditions) with generic and condition-specific knowledge about the most relevant health outcomes in somatic conditions and related risk and resilience factors [70]. Delivery of these treatments by E-health applications, which is very acceptable to patients, could contribute to the solution of this problem [71, 72].

Even though there is increasing evidence that tailoring psychological treatments to specific risk or resilience profiles increases their effectiveness [11, 12, 32, 33], more solid evidence for its added value above general psychological and psychopharmacological therapy protocols needs to be collected to determine the best implementation strategy for personalized healthcare. Because personalized treatment differs between individuals, this actually calls for a new way to evaluate its effectiveness. For example, a general benchmark of clinical significance for patients with chronic pain (e.g. a change of at least 3 on a visual analog scale) might be replaced by a personalized score for patients, depending on their baseline level of pain and on the amount of improvement they would consider personally meaningful [73]. Thus, instead of solely using generic outcomes, personalized treatment might best be evaluated by personalizing outcome assessments.

Comparison with Guidelines

For the psychological and psychopharmacological treatment of patients with (chronic) somatic conditions, usually two broad areas of guidelines are used, based on whether the emphasis lies on psychological or on somatic (co)morbidity.

In the area of psychological classification systems, the general classification system for diagnosing psychological disorders warranting psychological or psychotherapeutic intervention, the Diagnostic and Statistical Manual of Mental Disorders [74], primarily classifies problems as 'clinical syndromes', including adjustment problems, anxiety, depression and somatization (axis I diagnoses). For the majority of patients with chronic somatic conditions, however, these are a consequence of (or at least reinforced by) their medical condition. Diagnosing all these problems merely as axis III problems, thus as psychological problems secondary to a somatic condition, however, leads to a very undifferentiated diagnosis that does not provide the health professional with useful clues as to how to intervene. Finally, the complex interactions between physical, psychological and social factors (e.g. consequences of the condition and health behavior of patients) are usually insufficiently taken into account in this classification system.

In the area of somatic classification systems, guidelines for the treatment of chronic somatic conditions, including chronic obstructive pulmonary disease, diabetes mellitus, rheumatoid arthritis and somatoform disorders, often include a general statement that psychological self-management interventions could be part of treatment. These guidelines do not, however, distinguish between interventions that should and those that should not be psychotherapeutic in nature for specific risk groups of patients at risk of severe adjustment problems. In addition, common psychological (risk and resilience) factors between different somatic conditions are usually not taken into account. Finally, guidelines usually vary strongly between different somatic conditions with regard to their emphasis on the need of treatment for psychological problems.

Consequently, there is a need for a new classification system for categorizing physical, psychological and social

problems experienced by patients with chronic somatic conditions that takes into account the complex interactions between all these dimensions, accompanied by concrete guidelines stating on which grounds to intervene by means of which type of intervention.

Conclusions and Recommendations

Personalized healthcare for patients with somatic conditions is on its way to improve healthcare for all individuals. It has, however, been mainly restricted to biomedical markers guiding medical treatment. Even though psychological and psychopharmacological interventions and psychotherapy are also developing toward more differentiated care – for example, by developing stepped-care approaches depending on the severity of complaints [28, 75] – a coherent personalized healthcare framework for science, care and management beyond traditional diagnostics and treatments has not yet been developed. Based on generic principles, this article presents an innovative individualized approach to all kinds of chronic somatic conditions for which, currently, no clear psychotherapeutic guidelines exist. With this approach, different areas of evidence-based knowledge in psychotherapy are combined into an encompassing framework for personalized healthcare in the area of psychological interventions and psychotherapy for somatic conditions that is innovative in a number of regards: (1) it takes into account the complex interaction between physical, psychological and social factors in somatic conditions; (2) it makes use of generic and condition-specific screening instruments; (3) it offers personalized treatment modules that include the health problems most frequently experienced in the areas of physical, psychological and social functioning and connects them with the priorities of the individual patient; (4) it uses evidence-based principles for personalized treatment strategies, tailored to a patient's priorities with regard to treatment outcomes and individualized psychological risk and resilience factors, and (5) it provides possibilities for web-based application of screening and interventions (E-health). E-health could provide an optimal way to deliver these treatments to large groups of patients with different somatic conditions. In this way, personalized psychological interventions and psychotherapy for somatic conditions that incorporate E-health have the potential to increase efficiency, to ensure equity of treatment possibilities, and to enhance quality and patient empowerment in order to provide an opportunity for delivering effective care to large numbers of patients at diminished costs.

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