A realist review: what do nurse-led self-management interventions achieve for outpatients with a chronic condition?

Susanne M. van Hooft, Janet M.J. Been-Dahmen,
Erwin Ista, AnneLoes van Staa & Hennie R. Boeije

Journal of Advanced Nursing. 2016; 73(6), 1255-1271

ABSTRACT

Aim

The aim of this study was to examine how nurse-led interventions that support self-management of outpatients with chronic conditions work and in what contexts they work successfully.

Background

Self-management could be directed at goals such as quality of life, adherence, or patients' empowerment. Self-management support is an increasingly important task of nurses. Many nurse-led interventions have been developed but it is not clear how these actually help improve patients' self-management capabilities.

Design

Realist review

Data Sources

Primary research studies on self-management support interventions conducted by nurses from January 2000 until March 2015 were retrieved from all relevant databases. The studies had a before/after design and used qualitative and quantitative methods.

Review Methods

For each study we described how the intervention was supposed to improve self-management and compared this with the empirical evidence. Next, we described the Context-Mechanism-Outcome strings for each separate study, explored patterns and integrated the findings.

Results

Thirty-eight papers were included, evaluating 35 interventions concerning a diversity of conditions. Seven different context-mechanism-outcome strings were identified. Interventions focusing on patients' intrinsic processes were most successful. Least successful were interventions only providing education aimed at patient behaviour change. Various contexts can influence the success of the interventions: involvement of relatives, target group (i.e. chronic condition, motivation, being recently diagnosed or not), involvement of fellow patients and intervention group homogeneity or heterogeneity.

Conclusion

Successful interventions focus on patients' intrinsic processes (i.e. motivation or self-efficacy). This would guide nurses to decide what self-management support intervention they can best use in their specific setting and patient group.

Why is this research needed?

- The growing population of people with chronic conditions and the simultaneous increase of healthcare expenditures would benefit from effective self-management support.
- Self-management support is a core activity of nurses in outpatient settings. They are expected to know how a chronic condition impacts a patient's life and are therefore eminently suited to coach patients.
- The effective elements of nurse-led self-management interventions and the optimal circumstances have yet to be determined.

What are the key findings?

- Seven mechanism-outcome strings of interventions were identified. Nurse-led interventions focusing on patients' intrinsic motivation and self-efficacy were most successful.
- Least successful were interventions providing solely education aimed at changing patients' behaviour.
- Contexts that influence the effectiveness of an intervention are family involvement, type of condition, patient's motivation, recently diagnosed or not, peer support and intervention group homogeneity or heterogeneity.

How should the findings be used to influence policy/ practice/ research/ education?

- The influence of contexts on the effectiveness of an intervention should be taken into consideration when choosing or developing a self-management support intervention.
- Development of self-management support interventions should be based on theoretical concepts and proper selection of outcomes.

INTRODUCTION

The growing population of people with chronic conditions and the simultaneous increase of healthcare expenditures require effective interventions (WHO, 2005). Self-management is seen as a means to several ends: to improve patients' lifestyle or patients' adherence, to increase quality of life, or to empower patients (Wilkinson & Whitehead 2009, Kendall et al. 2011, Jonsdottir 2013). A much-used definition of self-management is: 'the individual's ability to manage symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition and to affect the cognitive, behavioural and emotional responses necessary to maintain a satisfactory quality of life. Thus, a dynamic and continuous process of self-regulation is established' (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002 p. 178). This definition implies that self-management is not only a matter of medical or symptom management, but also of incorporating disease in one's life. This is important because people often struggle with the social meaning of the chronic condition (Atkin et al. 2010) and have to deal with practical consequences of the condition and the treatment in daily life. Self-management requires an active role of patients, since it implies a responsibility for *self* managing the condition (Lorig & Holman, 2003).

Background

Although self-management is a task for the patients themselves, they may need support. Self-management support (SMS) requires a multidisciplinary approach (Wagner et al. 2001), but in practice is often provided by outpatient clinic nurses. Self-management support is a core activity of outpatient nurses (Elissen et al. 2013). They are expected to have insight into the impact of a chronic condition on a patient's life and are therefore designated to coach patients in their self-management (Schenk & Hartley 2002, Alleyne et al. 2011, Elissen et al. 2013).

Many self-management interventions are composed of multiple, interacting components and can therefore be regarded as complex (Campbell et al. 2000). Possible components are for instance the means of providing the content of the intervention, the theory on which it is built, the professionals executing the intervention and clinical guidelines (Clark 2013). Added to this complexity is the fact that different factors may influence the patient's self-management and consequently it is to be expected that there is no one-size-fits-all intervention that works for all patients and for all patient groups (Coster & Norman 2009, Bonell et al. 2012).

Although several recent reviews proved that certain self-management interventions were useful, it is not clear to what components success can be ascribed, for whom these interventions work and in what circumstances (Radhakrishnan 2012, Jones et al. 2014, Tu et al. 2015). Reviews often examine one specific type of intervention or one specific

chronic condition (Bonner et al. 2014, Kuo et al. 2014, Song et al. 2014). Besides, not all of these reviews are aimed at interventions specifically conducted by nurses (Bentsen et al. 2012, Radhakrishnan 2012, Bonner et al. 2014). Furthermore, the realist review methodology was developed precisely to examine what works for whom and why; on which theoretical assumptions interventions are based, how they are supposed to work and why they work or do not work in certain circumstances. A realist review provides explanatory rather than evaluative results, which is an added value of the evidence provided by traditional reviews. So realist reviews are also suitable for topics on which there is a certain amount of evidence (e.g. Kane et al. (2010), Kousoulis et al. (2014)).

This is why the methodology is suitable for reviewing complex interventions aimed at people with different and often multiple conditions

THE REVIEW

Aim

The objective of this realist review was to examine how nurse-led interventions that support self-management of outpatients with chronic conditions work and in what contexts they work successfully.

Design

The theory-driven realist review methodology can synthesise a diversity of evidence about the effectiveness of interventions in real life settings (Pawson & Tilley 1997, Pawson et al. 2004, Pope et al. 2007). Underlying theories and assumptions of an intervention are tested and give insight into how and why complex interventions do or do not work in a specific context (Pawson et al. 2004, Pawson et al. 2005). In other words, a realist review identifies the pathways successful interventions follow (Pawson et al. 2004). An essential element is the description of a mechanism: defined as a reaction triggered by the intervention in a certain context and that leads to a certain outcome (Kane et al. 2010). The contexts, mechanisms and outcomes of an intervention are the cornerstones of a realist review. Linking these three elements leads to the so called 'context-mechanism-outcome strings' (CMOs), which articulate the interaction between the intervention, the context where the intervention is applied and the mechanisms that are set in motion by this interaction – leading up to an outcome (Pawson et al. 2005). In contrast to the traditional systematic reviews, the realist review methodology allows to include a variety of study designs, not only Randomized Clinical Trials. Whilst conducting a realist review is an iterative process, the review was conducted according to sequential steps (Pawson et al. 2005) (Table 1).

Table 1. Steps in the realist review based on Mogre et al. (2014) and Yardley et al. (2015)

Step	Summary of approach
1. Clarifying the scope of the review	• The objective of this realist review was determined. The scope involves nurse-led interventions for self-management support of outpatients with chronic conditions.
2. Determining the search strategy and	• A search strategy was developed (Supplement 1). Only studies using a comparison between 'standard care' and self-management support interventions (e.g. RCT, before-after design and qualitative and quantitative methods) were included. Inclusion criteria were: self-management support interventions with a prominent role for nurses, outpatient clinic setting, adults with chronic condition, evaluation study, and written in the English language. Studies were excluded if results were not measured at a patient level, if the setting was a palliative care, primary care, or psychiatric care.
3. Ensuring proper article selection and appraisal of evidence	• According to the realist review approach, studies were selected based on rigor and relevance. In addition studies quality appraisal occurred with appropriate instruments (one for qualitative and one for quantitative studies).
4. Extracting of data	• Data extraction forms were used to organize data. Information was obtained about: a) design of the study, b) characteristics of the intervention, and c) the underlying theory (either implicitly or explicitly mentioned).
5. Synthesis of findings and drawing conclusions	• Synthesis of the findings: underling theories were compared with the empirical evidence. The Context- Mechanism-Outcome (CMO) for each separate study was described, and patterns in the CMOs were explored. Conclusions were drawn about in what works for whom, in what circumstances.

Search methods

The Embase, Medline OvidSP, CINAHL, Web-of-science, PsychINFO, OvidSP, Cochrane central and PubMed Databases were searched from January 2000 until March 2015 for nurse-led SMS intervention studies. Various search terms for self-management, evaluation, chronic disease and nurses were used (Supplement 1). The scope of our search was deliberately broad because many self-management support needs are not disease-specific but generic in nature. They are mostly dependent on patients' subjective health perceptions and the availability of social support (Van Houtum et al. 2013, Dwarswaard et al. 2016).

Search outcome

The search yielded almost 4,000 references. After removing duplicates, we screened 3022 abstracts, of which 314 full texts articles were assessed for eligibility (Figure 1). The exclusion of articles which did not meet the inclusion and exclusion criteria reduced the number of studies to 38.

Quality appraisal

Methodological quality of the qualitative studies was assessed with the Qualitative research review guidelines - RATS (Clark 2003). Methodological quality of RCTs was

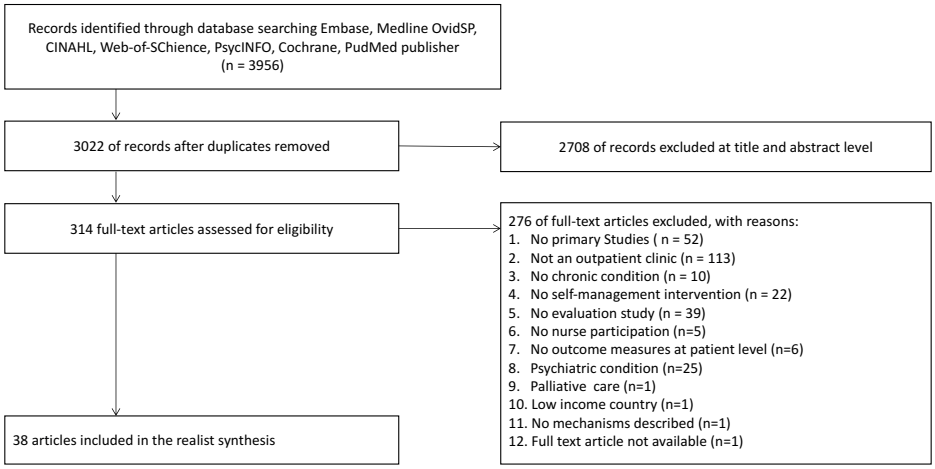

Figure 1. Flowchart of studies from identification to inclusion

assessed with the Cochrane 'Risk of bias' tool (Higgins et al. 2011). Other quantitative studies were assessed with the rating system of Anderson and Sharpe (1991) adapted by Huis et al. (2012) (Supplement 2). In realist reviews, however, eligibility of studies is based on rigor and relevance for the objective of the review rather than on the established quality (Pawson et al. 2004).

Data abstraction

Titles, abstracts and subject headings of the retrieved citations were screened for relevance and full-texts of potentially eligible studies were evaluated. In case of doubt, a third reviewer was consulted. Inclusion criteria were: SMS interventions with a prominent role for nurses, outpatient clinic setting, evaluation study, adults with chronic condition and written in the English language. 'Evaluation study' was defined as a study comparing 'standard care' with SMS interventions (e.g. RCT, before-after) design and/or using qualitative evaluation. Studies were excluded if results were not measured at a patient level, if the setting was palliative care, primary care, or psychiatric care. These exclusion criteria were chosen because the interventions should be targeted at people with somatic chronic conditions in an outpatient hospital setting.

Synthesis

First, the full texts of included studies were reviewed and data were extracted. Information was obtained about: A. design of the study, B. characteristics of the intervention and C. the underlying theory. If theoretical assumptions were not provided, the corresponding author was contacted. Reporting effectiveness evidence, including estimates of precision, is not always done in realist reviews, although there are some examples of realist reviews

that do (Leeman et al. 2010, Hoare et al. 2012). We also decided to report these effect sizes to enhance interpretation of the studies. If possible, effect sizes with the bias-corrected effect size Hedges (G) were calculated (Fritz, Morris, & Richler, 2012) (Supplement 3).

The research team reached consensus about the extraction and interpretation of the data in several rounds. A study's underlying theory, either implicitly or explicitly mentioned, was compared with the empirical evidence reported in the study. The CMO for each separate study was described and patterns in the CMOs were explored to explain what interventions worked in what settings.

RESULTS

We included 35 different intervention studies reported in 38 papers. Two interventions were evaluated qualitatively, one was a mixed methods case-study, the other 32 interventions were evaluated with a quantitative design (of which 21 were RCTs). The 35 studies included a total of 3,490 patients, representing a diversity of chronic conditions (Table 2; a more comprehensive table with statistical outcomes is provided in Supplement 3). Most interventions contained educational and counselling components; some involved physical exercises. Often, interventions were provided in group sessions, sometimes combined with individual sessions. Only few studies described a self-monitoring intervention.

Underlying theories

A study's underlying theory not always corresponded with the theory found in the empirical evidence. Therefore we distinguish two types below: espoused theories (the theory mentioned as base for the interventions) and theories-in-use (how interventions had actually worked) (Argyris 1976).

Espoused theories

Based on the espoused theory we distinguished five categories of interventions, addressing respectively: (i) knowledge; (ii) behavioural change; (iii) coping; (iv) motivation; and (v) self- efficacy. (i) Thirteen studies involved interventions with an emphasis on knowledge gain through the provision of education – with the (often tacit) assumption that education would lead to the desired behavioural change; (ii) Six interventions aimed at changing the patient's lifestyle and thus at behavioural change; (iii) Nine studies aimed at coping with the symptoms of the chronic condition. The focus lies primarily on re-interpretation of symptoms and dealing with stress; (iv) Two studies involved interventions aimed at increasing the patient's motivation (v) Six interventions focus on self-efficacy. The espoused theories are described in Box 1.

Table 2 Overview of selected studies (in alphabetical order by first author)

Author(s); year of publication; country	Intervention characteristics	Design	Patient group characteristics (*n; diagnosis*)
Akyil & Ergüney (2012), Turkey	Education Individual	Quasi experimental design with control group	*n=65* Chronic Obstructive Pulmonary Disease (COPD)
Bakan & Akyol (2007), Turkey	Counselling Group & individual Self-monitoring Family involvement	RCT	*n= 43* Chronic Heart Failure (CHF)
Balk et al. (2008), The Netherlands	Education Individual Self-monitoring	RCT	*n=214* CHF
Carrieri-Kohlman et al. (2005), USA	Education Individual Physical exercises	Prospective, randomized single-blind trial	*n=103* COPD
Choi & Lee (2012), Korea	Education Counselling Group & individual	RCT	*n=61* Chronic Kidney Disease (CKD)
Donesky et al. (2013), USA	Education Individual Physical exercises	RCT	*n=115* COPD
Gonzalez et al. (2014), USA	Education Individual	Single-group before after design	*n=30* Venous ulcers
Goossens et al. (2014), Belgium	Education Individual	Descriptive, cross-sectional study	*n=317* Congenital heart disease (CHD)
Grilo et al. (2015), USA	Education Counselling Individual Self-monitoring	Pilot clinical trial	*n=28* Uncontrolled hypertension and comorbid Diabetes Mellitus (DM) type 2
Hagberth et al. (2008), Sweden	Education Group	Qualitative descriptive study	*n=13* Asthma
Howden et al. (2015), Australia	Education Counselling Individual Physical exercise	RCT	*n=83* CKD
Huang et al. (2008), Taiwan	Education Individual Self-monitoring Family involvement	RCT	*n=148* Asthma
Jiang & He (2012), China	Education Counselling Individual	RCT	*n=96* COPD

Table 2 Overview of selected studies (in alphabetical order by first author) (*continued*)

Author(s); year of publication; country	Intervention characteristics	Design	Patient group characteristics (*n; diagnosis*)
Kara & Asti (2003), Turkey	Education Groups & individual Physical exercises Family involvement	RCT	*n=60* COPD
Kaşıkçı (2010), Turkey	Education Individual Physical exercises	Case-study	*n=1* COPD
Lee et al. (2014), South Korea	Counselling Individual	RCT	*n=151* COPD
Lindskov et al. (2007), Sweden	Education Individual Groups for family	Naturalistic non-randomized waiting list controlled trial	*n=48* Parkinson's Disease
Monninkhof et al. (2003), The Netherlands	Education Exercises Groups Family involvement	RCT	*n=248* COPD
Moriyama et al. (2009), Japan	Education Counselling Individual Self-monitoring Family involved	RCT	*n=65* DM type 2
Otsu & Moriyama (2011), Japan	Education Counselling Individual Self-monitoring Family involvement	RCT	*n=102* CHF
Otsu & Moriyama (2012), Japan	Education Counselling Individual Self-monitoring Family involvement	RCT	*n=94* CHF
Ronning et.al. (2013), Sweden	Education Counselling Individual	Single group before- after design	*n=55* Congenitally malformed hearts
Rootmensen et al. (2008), The Netherlands	Education Individual	RCT	*n=191* COPD
Sarian et al. (2012), Canada	Education Groups Family involvement	Single group before after test	*n=10* Peritoneal dialysis patients

Table 2 Overview of selected studies (in alphabetical order by first author) (*continued*)

Author(s); year of publication; country	Intervention characteristics	Design	Patient group characteristics (*n; diagnosis*)
Scheurs et al. (2003), The Netherlands	Education Counselling Groups	Single group before-after design	*n=83* Asthma, DM, and CHF
Smeulders et al. 2010a/b), The Netherlands	Education Groups	RCT	*n=317* Congestive heart failure
Trappenburg et al. (2008), The Netherlands	Education Individual Telemonitoring	Non randomized controlled multicenter study	*n=115* COPD
Tsay et al. (2005), Taiwan	Education Counselling Groups	RCT	*n=57* End-stage renal disease
Van der Meer et al. (2009), The Netherlands	Education Groups Telemonitoring	RCT	*n=200* Asthma
Van Os-Medendorp et al. (2007a), The Netherlands	Education Counselling Individual	Mixed-methods	*n=65* Chronic pruritic skin disease
Van Os-Medendorp et al. (2007b), The Netherlands	Education Counselling Individual	RCT	*n=65* Chronic pruritic skin disease
Williams et al. (2012), Australia	Education Counselling	RCT	*n=78* CKD, DM, and cardiovascular disease
Wilson et al. (2008), Ireland	Education Counselling Individual & groups	RCT	*n=91* COPD
Yildiz & Kurcer (2012), Turkey	Education Counselling Individual	Single-group before-after design	*n=84* CKD
Yu et al. (2014), China	Education Individual Family involvement	Non-randomized controlled trial	*n=84* COPD
Zoffman & Kirkevold (2012), Denmark	Counselling Individual	Qualitative evaluation study	*n=50* DM type 1
Zoffman & Lauritzen (2006), Denmark	Counselling Group	RCT	*n=30* DM type 1

Box 1. Espoused theories: Underlying theories within the categories of interventions

Knowledge	
Theory of constructivism (Bodner, 1986)	Rönning et al.(2011)
Chronic Care Model (Wagner, 2001)	Grilo et al. (2015), Sarian et al. (2012)
Orem's theory of self-care (Orem, 1983)	Gonzales (2014)
No theory mentioned	Balk et al. (2008), Goossens et al. (2014), Howden et al.(2015), Huang et al. (2009), Lindskov et al. (2007), van der Meer et al. (2009), Rootmensen et al. (2008), Trappenburg et al. (2008), Yildiz & Kurcer (2012)
Behaviour change	
Theory of cognitive behaviour (Lindeman, 1989)	Otsu & Moriyama (2011), Otsu & Moriyama (2012), Moriyama et al. (2009)
Theory of Planned Behaviour (Ajzen, 1991)	Wilson et al. (2008)
Health Belief Model (Becker & Maiman, 1975)	Williams et al. (2012)
Trans-theoretical model of stages of change (Prochaska et al., 1985)	Wilson et al. (2008), Zoffmann & Lauritzen (2006)
No theory mentioned	Choi & Lee (2012)
Coping	
Vifladt & Hopen model (Vifladt & Hopen, 2004)	Hagberth et al. (2008)
Self-Regulation Model (Leventhal et al., 2003)	Schreurs et al.(2003)
Pro-active coping theory	Schreurs et al.(2003)
Transactional Model of Stress and Coping (Lazarus, 1993)	Jiang & He (2012), van Os-Medendorp et al. (2007a), van Os-Medendorp et al. (2007b), Tsay et al. (2005)
Roy's Adaptation Model (Whittemore & Roy, 2002)	Akyil & Ergüney (2012), Bakan & Akyol (2007)
No theory mentioned	Lee et al. (2014), Monninkhof et al. (2003)
Motivation	
Self-determination theory (Zoffmann, 2004).	Zoffmann & Lauritzen (2006), Zoffmann & Kirkevold (2012)
Self-efficacy	
Social Cognitive Theory (Bandura, 1991)	Carrieri-Kohlman et al. (2005), Donesky et al. (2013), Kara & Aşti (2004), Kaşikçi (2010), Smeulders et al. (2010a), Smeulders et al. (2010b), Yu et al. (2014)

Theories in use: contexts, mechanisms and outcomes

We found three different mechanisms in the interventions: increase patients' knowledge, patients' skills enhancement and increase patients' motivation. Three different outcomes of the interventions were identified: behavioural change, increase of coping and increase of self-efficacy.

On the basis of the theory-in-use we identified seven different strings that linked the mechanisms and the outcomes (Figure 2). For instance, regarding an intervention aimed at explaining the risks of certain behaviour (knowledge) it is assumed that patients will effectively change their behaviour after learning about the risks. In certain contexts the aim could be realised. The CMO-strings we identified by comparing all studies are described below and presented in Supplement 4.

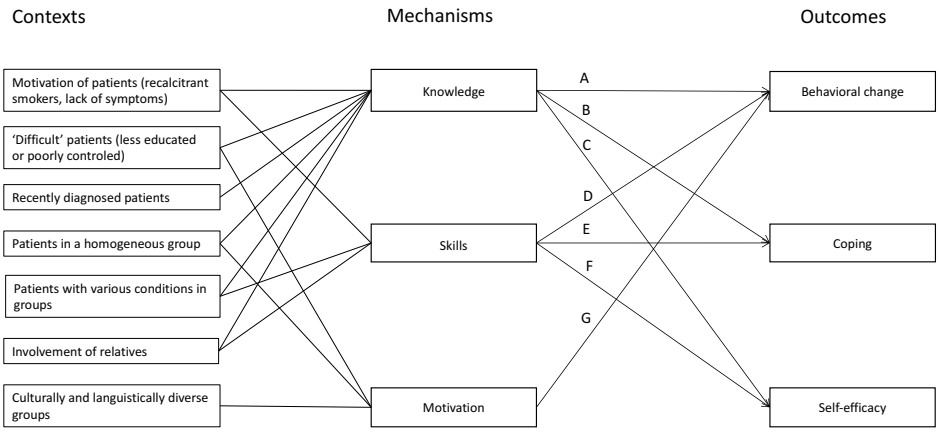

Figure 2. A to G: strings between Mechanisms and Outcomes

String A Knowledge leads to behavioural change

Interventions that follow this string are based either on the espoused theories emphasizing knowledge and cognition (Balk et al. 2008, Rootmensen et al. 2008, Trappenburg et al. 2008, Huang et al. 2009, Van der Meer et al. 2009, Rönning et al. 2011, Yıldız & Kurcer 2012, Gonzalez 2014, Goossens et al. 2014, Howden et al. 2014, Yu et al. 2014, Grilo et al. 2015), on the one aiming at behavioural change (Wilson et al. 2008, Moriyama et al. 2009, Otsu & Moriyama 2011, Choi & Lee 2012, Otsu & Moriyama 2012), or on the one aiming at self-efficacy (Yu et al. 2014). Education was offered about the disease, its symptoms, medication and the importance of adherence. Also, (self-)monitoring was applied to provide patients feedback about their knowledge gain and behavioural change (Balk et al. 2008, Trappenburg et al. 2008, Huang et al. 2009, Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012, Grilo et al. 2015). In one intervention, the patients' families were involved (Moriyama et al. 2009). Most interventions used a mixture of means (Supplement 5).

These interventions did not always lead to the desired behaviour; for example, in the context of recalcitrant smokers who lacked symptoms of dyspnoea and had little confidence that another attempt to quit smoking would be successful (Wilson et al. 2008) or in the context of food-insecure patients with uncontrolled hypertension and comorbid diabetes type 2 (Grilo et al. 2015). Interventions employing re-enforcement education were more successful, i.e. when the nurse repeated the information in the next consultations or in telephone calls and answered individual questions (Huang et al. 2009, Choi & Lee 2012). Thus, the information was tailored to individual needs, enabling patients to relate it to their own situation.

Self-monitoring (by receiving feedback via a TV-channel or computer program about the accuracy of their answers to questions) was successful in that it stimulated learning.

Thereby, patients who were recently diagnosed learned to recognise warning signs that required behaviour change (Balk et al. 2008, Huang et al. 2009). However, self-monitoring had no added value for people who had received the diagnosis long ago.

In spite of the prominent role of education in these interventions, knowledge gain was often not measured (Trappenburg et al. 2008, Wilson et al. 2008, Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012, Yıldız & Kurcer 2012, Gonzalez 2014, Howden et al. 2014, Lee et al. 2014, Yu et al. 2014, Grilo et al. 2015). The effect evaluation of most of the studies that did measure knowledge gain showed that patients' knowledge had increased, irrespective of context and education program (Balk et al. 2008, Rootmensen et al. 2008, Huang et al. 2009, Choi & Lee 2012, Goossens et al. 2014). But change of behaviour was only achieved if re-enforcement and repeated education sessions were provided (Huang et al. 2009, Choi & Lee 2012). The involvement of family did not seem to affect effectiveness.

In summary, re-enforcement education and tailored knowledge gained from answers to individual questions led to behavioural change in recently diagnosed patients. This string was less successful for target groups with little confidence in their ability to change behaviour and for patients who fail to see any effect of behavioural change on their symptoms.

String B Knowledge leads to coping

Some interventions following this string are based on the espoused theory emphasizing knowledge and cognition (Lindskov et al. 2007, Sarian et al. 2011), but most are based on the one emphasizing coping (Monninkhof et al. 2003, Schreurs et al. 2003, Tsay et al. 2005, Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007b, Bakan & Akyol 2008, Hagberth et al. 2008, Jiang & He 2012, Akyil & Ergüney 2013). Their common feature is teaching patients how to re-interpret the symptoms of their chronic condition. This was usually done by the nurse, but in some studies disease-related information and experiences were discussed with fellow patients and/or family (Bakan & Akyol 2008, Hagberth et al. 2008, Sarian et al. 2011).

In many interventions patients played an active role: e.g. keeping diaries, doing homework or using a self-help manual (Supplement 5). Sharing experiences and, by doing so, learning from fellow patients helped patients feel understood and made it easier for them to adapt the knowledge to their own situation than when a professional provided information. However, patients mentioned that this was not useful for all topics (Hagberth et al. 2008).

In several interventions, information about symptoms was given by professionals, which enabled patients to re-interpret the symptoms (Monninkhof et al. 2003, Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007, Bakan & Akyol 2008, Hagberth et al. 2008, Jiang & He 2012, Akyil & Ergüney 2013). Through this reinterpretation,

patients were more successful in dealing with these symptoms (Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007b, Jiang & He 2012, Akyil & Ergüney 2013). Learning from fellow patients usually made it easier to adapt the knowledge to the own situation than when a professional provided information. Some interventions consisted of goal-setting (Monninkhof et al. 2003, Bakan & Akyol 2008), activating the family (Monninkhof et al. 2003, Bakan & Akyol 2008, Sarian et al. 2011), or keeping a diary so as to raise awareness of how they dealt with symptoms (Schreurs et al. 2003, Tsay et al. 2005, Van Os-Medendorp et al. 2007b). The latter was not always successful, because the patients participating in these interventions did not appreciate the home-work, which accompanied the diary keeping, before the consultations with the professional.

Although interventions and contexts differed, most interventions following this string seemed to improve coping strategies. Knowledge gain – the starting point of this string – was demonstrated in only two interventions (Hagberth et al. 2008, Sarian et al. 2011). The other eight studies, though, had not included this in the effect evaluation.

To sum up, interventions using this string were successful in various chronic conditions when experiences and disease-related information were shared with fellow patients or relatives and when information was personalised. This enabled patients to re-interpret the information and the symptoms – and thus to better cope with the disease. Less successful were interventions asking patients to keep a diary (Supplement 4).

String C Knowledge leads to self-efficacy

Interventions following this string are based on the espoused theory emphasizing self-efficacy (Kara & Şşti 2004, Carrieri-Kohlman et al. 2005, Smeulders et al. 2010a, Smeulders et al. 2010b, Kaşıkçı, 2011, Donesky et al. 2014).

Education was provided about managing day-to-day disease related problems – via telephone interviews, brochure or group sessions (Supplement 5). In some interventions patients were encouraged to share experiences with fellow patients or experienced laymen (modelling) (Kara & Şşti 2004, Smeulders et al. 2010a, Smeulders et al. 2010b). This provided ready-to-use information and made patients feel acknowledged and more self-confident.

Two of the six studies, both in COPD patients, showed significantly increased self-efficacy (Kara & Şşti 2004, Kaşıkçı 2011). The other studies had either not measured the effect on self-efficacy (Carrieri-Kohlman et al. 2005, Donesky et al. 2014), or reported that patients' self-efficacy did not increase (Smeulders et al. 2010a, Smeulders et al. 2010b). Although providing and discussing knowledge was key to all interventions in this string, none of the studies described whether patients' knowledge had increased. This *string* was successful in the context of COPD in both individual and group counselling sessions focusing on day-to-day problems.

String D Skills enhancement leads to behavioural change

The interventions following this string are based on the espoused theory emphasizing knowledge and cognition (Rootmensen et al. 2008, Huang et al. 2009) and on the one emphasizing behavioural change (Wilson et al. 2008, Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012). All interventions aimed at learning 'how-to'- skills, such as inhalation (Rootmensen et al. 2008) and relaxation techniques (Wilson et al. 2008), abandoning smoking (Rootmensen et al. 2008, Wilson et al. 2008, Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012), or alcohol use (Otsu & Moriyama 2011, Otsu & Moriyama 2012), preventing exacerbation (Rootmensen et al. 2008), or using a peak flow meter for monitoring of the condition (Huang et al. 2009). Usually the nurse provided support, but sometimes also family members, who received the same instructions (Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012). Other means of these interventions include check-and-correct skills, daily exercises, personal targets, record keeping and motivational interviewing.

All interventions following this string also followed string A. In one study this proved to be a successful combination, because patients learned how to monitor their asthma and received feedback about their self-management by rating the symptoms on a scale and using a peak flow meter (Huang et al. 2009). This study showed significant positive effects on both skills and change of behaviour. The other studies either not measured these outcomes (Moriyama et al. 2009), or were not entirely successful (Rootmensen et al. 2008, Wilson et al. 2008, Otsu & Moriyama 2011, Otsu & Moriyama 2012). For instance, this combination of *string*s was less successful in the context of poorly motivated patients and reluctant smokers (Wilson et al. 2008, Moriyama et al. 2009). Some interventions did not take skills achievement into account in the effect measurement, but could be regarded as successful in terms of better clinical outcomes (Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012).

In short, this *string* was not successful in the context of poorly motivated patients, nor was the additional instruction of family members effective. However, it was successful in the context of patients with asthma, who learned to effectively monitor their condition.

String E Skills enhancement leads to coping

All interventions following this string are based on the espoused theory emphasizing coping (Monninkhof et al. 2003, Schreurs et al. 2003, Tsay et al. 2005, Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007b, Jiang & He 2012, Lee et al. 2014). The interventions aimed to improve coping with symptoms through education on practical self-management tasks, such as peak flow monitoring, but also skills for stress reduction. Means of these interventions were diary records, instruction booklets, self-help manuals and peer groups. In two studies, skills were practiced in a group with fellow patients and this approach appeared to be successful (Schreurs et al. 2003, Tsay et al. 2005). These

patients also set personal goals, kept diary records and discussed these with fellow patients. Eventually they could better cope with stress- and health-related problems caused by their chronic condition. All studies but one combined teaching skills with the provision of knowledge (via string B). In the exceptional study, when information was needed nurses referred patients to educational material they had received earlier (Lee et al. 2014). This approach was not successful. However, the combination of strings B and F seemed to be successful in improving coping strategies. In one study patients with COPD were reminded through telephone calls to practice distraction and relaxation skills (Jiang & He 2012). This approach considerably improved coping skills.

In sum, this string was successful if realistic goals were set and skills were practiced in either individual sessions or homogeneous patient groups.

String F Skills enhancement leads to self-efficacy

All interventions following this string are based on the espoused theory emphasizing self-efficacy (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Smeulders et al. 2010a, Smeulders et al. 2010, Kaşıkçı 2011, Donesky et al. 2014). All interventions combined this string with string C *'Knowledge leads to self-efficacy'*. They included 'mastery experiences', 'verbal encouragement', 'modelling' and 'adverse emotional or physical arousal' (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Smeulders et al. 2010a, Smeulders et al. 2010b, Kaşıkçı 2011, Donesky et al. 2014), to be achieved by supervised training, record keeping, setting personal targets, home exercise and group support. Two interventions used group-training sessions, among other things to increase patients' confidence and thus their self-efficacy (Kara & Aşti 2004, Smeulders et al. 2010a, Smeulders et al. 2010b). Newly learned behaviour was sustained through encouragement from the healthcare professional or fellow patients and thereby improved self-efficacy (Kara & Aşti 2004, Kaşıkçı 2011). This approach was not successful in all studies. In one study, the effect on self-efficacy was not sustained. The researchers explained this by the short duration of the intervention (one year) (Smeulders et al. 2010a, Smeulders et al., 2010b).

Overall, this string was successful in the context of patients with COPD who received feedback from either healthcare professionals or peers and who saw other patients performing exercises.

String G Motivation leads to behavioural change

Interventions following this string are based on the espoused theory emphasizing behavioural change (Williams et al. 2012) and the one emphasizing motivation (Zoffmann & Lauritzen 2006, Zoffmann & Kirkevold 2012). Several interventions made use of motivational interviewing, phone calls, interpreters and personal targets (Supplement 5). In two studies involving patients with poorly controlled diabetes, patients reflected on their problems with the aid of reflection worksheets (Zoffmann & Lauritzen 2006,

Zoffmann & Kirkevold 2012). Qualitative data showed that patients became internally motivated to follow lifestyle adjustments and were more capable to integrate the chronic condition into their lives. The intervention groups showed a substantial level of behavioural change.

Another study described an intervention using culturally-adjusted information provision. An interpreter translated the messages of the nurse into the patients' own language. Although patients perceived the sessions as helpful, actual change of behaviour could not be proven (Williams et al. 2012).

This string was successful in the context of patients with poorly controlled diabetes who worked with reflection sheets (Zoffmann & Lauritzen 2006, Zoffmann & Kirkevold 2012). Deploying interpreters in the context of culturally and linguistic diverse patient groups was less successful.

DISCUSSION

This realist review aimed to explore how nurse-led interventions that support self-management of outpatients with chronic conditions work and in what contexts they work successfully. The theories in use were determined and accordingly, seven strings of interventions were identified.

Interventions that focused on patients' intrinsic processes (self-efficacy and motivation, in strings C, D and G) were the most successful ones (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Zoffmann & Lauritzen 2006, Kaşıkçı 2011, Zoffmann & Kirkevold, 2012). This focus appealed to patients' internal perceived locus of control, which is important for persistence and performance of new behaviour (Ryan et al. 1995). Overall, least successful was *string* A where education was assumed to lead to behavioural change. Our review demonstrates that when patients are not confident of their power to change their behaviour or if they do not immediately see positive results of their efforts, education alone will not result in behavioural change. This is in agreement with previous systematic reviews which concluded that education is not sufficient to incite behavioural change (Coster & Norman 2009, Barlow et al. 2010). Our review adds that behavioural change could be successfully achieved by re-enforcement of education, tailoring the information to the individual patient's need and by combining knowledge transfer with skills enhancement.

Various contexts were found to influence the effectiveness of interventions. Relatives were involved in the strings with knowledge as a starting point (A, B, C) and this seemed to have a surplus value, as patients felt more supported in daily life. This is in line with findings from a qualitative synthesis of patients' self-management needs, which concluded that relatives' support is essential (Dwarswaard et al. 2016). Other relevant

contexts are the target group (condition, extent of motivation, recently diagnosed or not), the use of peers and group homogeneity or heterogeneity. In all *strings*, most interventions were developed for homogeneous groups of patients and the homogeneity mostly had a positive impact on recognition and confidence.

Limitations and strengths

This review represents interventions concerning a variety of chronic conditions but is not exhaustive in this respect; e.g. rheumatic disorders are lacking. Studies on this condition were retrieved in the initial search, however, but did not meet the selection criteria. Some were not an empirical study (Lagger et al. 2010, Faradji et al. 2012); others were outdated (Sinclair et al.1998). It is also possible that, due to our 'nurse-led' and 'outpatient ward' criteria, we might have missed other relevant studies.

Due to the broad approach of our search strategy, many different diseases and different types of interventions were included in our review. This complicates the comparison between interventions. In van Houtum's study among a large sample of Dutch patients with different chronic conditions, self-management tasks and support needs were only partly determined by disease-related factors (2013).While the methodology of realist review has been well described (Pawson et al. 2004), realist reviews differ in the way they are executed or documented (Kane et al. 2010, Wong et al. 2010, Higgins et al. 2012). Identifying mechanisms and the corresponding contexts and outcomes, may require a long, continuous process of abductive thinking, reflection and debating (Jagosh et al. 2013). In the current review we worked cyclically to discover what each decision in the study meant for the steps yet to come. Close collaboration between all team members was beneficial for finding creative solutions as a component of abductive thinking and for reflection.

Practice implications

The insights of this review may help nurses decide what self-management support intervention they can best use in their specific setting and patient group. Preferably they should select interventions aimed at increasing patients' motivation and self-efficacy, instead of focusing solely on education. Involving peers or relatives could be helpful in achieving these goals.

Different espoused theories were found in the primary evaluation studies. In thirteen studies (34%) no clear underlying theory was mentioned but they could implicitly be linked to existing theories. To evaluate properly the mechanisms that make an intervention 'work', a clear theoretical base underlying the intervention is crucial (Clark 2013, Pawson & Tilley 1997). A theoretical framework provides not only suggestions of how to measure the effects but also appropriate targets for the intervention (Van Os et al. 2004, Michie & Prestwich 2010).

In complex interventions, the role of the healthcare professional is of great influence on the outcomes (Disler et al. 2012, Clark 2013). Nurturing relationships with healthcare professionals may stimulate patient's self-efficacy to manage a chronic condition (Disler et al. 2012). Although suitable training offers resources to support patients effectively (MacDonald et al. 2008), only few authors of the reviewed papers described how healthcare professionals were trained prior to the intervention. This aspect deserves more attention in the description of the intervention in forthcoming studies.

CONCLUSION

Until now it was not known what elements of nurse-led SMS interventions were effective. This realist review discusses some of the working elements and shows that interventions focusing on patients' intrinsic processes were most successful. It clarifies in what context nurse-led interventions in supporting self-management of outpatients with chronic conditions will be effective or not. These insights may help nurses choose the appropriate SMS intervention for their target group. The specific context (the involvement of family or relatives, the target group of chronic ill patients, the involvement of fellow patients and intervention group homogeneity or heterogeneity) should be taken into account because not all interventions work for all patients in all circumstances. When developing an intervention, using an underlying theory is recommended because this provides guidance as to what outcome the intervention should be aimed at.

REFERENCES

Ajzen I. (1991) The theory of planned behavior. *Organizational behavior and human decision processes* **50**, 179-211.

Akyil R.Ç., & Ergüney S. (2013) Roy's adaptation model-guided education for adaptation to chronic obstructive pulmonary disease. *Journal of Advanced Nursing* **69**, 1063-1075.

Alleyne G., Hancock C., & Hughes P. (2011) Chronic and non-communicable diseases: a critical challenge for nurses globally. *International Nursing Review* **58**, 328-331.

Anderson L.A., & Sharpe P.A. (1991) Improving patient and provider communication: a synthesis and review of communication interventions. *Patient Education and Counseling* **17**, 99-134.

Argyris C. (1976) Single-loop and double-loop models in research on decision making. *Administrative Science Quarterly* **21**, 363-375.

Atkin K., Stapley S. & Easton A. (2010) No one listens to me, nobody believes me: Self management and the experience of living with encephalitis. *Social Science & Medicine* **71**, 386-393.

Bakan G. & Akyol A.D. (2008) Theory-guided interventions for adaptation to heart failure. *Journal of Advanced Nursing* **61**, 596-608.

Balk A.H., Davidse W., Dommelen P., Klaassen E., Caliskan K., Burgh P. & Leenders C.M. (2008) Tele-guidance of chronic heart failure patients enhances knowledge about the disease. A multi-centre, randomised controlled study. *European Journal of Heart Failure* **10**, 1136-1142.

Bandura A. (1991) Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes* **50**, 248-287.

Barlow C., Cooke D., Mulligan K., Beck E. & Newmann S. (2010) A critical review of self-management and educational interventions in inflammatory bowel disease. *Gastroenterology Nursing* **33**, 11-18.

Barlow J., Wright C., Sheasby J., Turner A. & Hainsworth J. (2002) Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling* **48**, 177-187.

Becker M.H. & Maiman L.A. (1975) Sociobehavioral determinants of compliance with health and medical care recommendations. *Medical Care* **13**, 10-24.

Bentsen S.B., Langeland E. & Holm A.L. (2012) Evaluation of self-management interventions for chronic obstructive pulmonary disease. *Journal of Nursing Management* **20**, 802-813.

Bodner G.M. (1986) Constructivism: A theory of knowledge. *Journal of Chemical Education* **63**, 873.

Bonell C., Fletcher A., Morton M., Lorenc T. & Moore L. (2012) Realist randomised controlled trials: a new approach to evaluating complex public health interventions. *Social Science & Medicine* **75**, 2299-2306.

Bonner A., Havas K., Douglas C., Thepha T., Bennett P. & Clark R. (2014) Self-management programmes in stages 1–4 chronic kidney disease: a literature review. *Journal of Renal Care* **40**, 194-204.

Campbell M., Fitzpatrick R., Haines A., Kinmonth A.L., Sandercock P., Spiegelhalter D. & Tyrer P. (2000) Framework for design and evaluation of complex interventions to improve health. *British Medical Journal* **321**, 694-696.

Carrieri-Kohlman V., Nguyen H.Q., Donesky-Cuenco D., Demir-Deviren S., Neuhaus J. & Stulbarg M.S. (2005) Impact of brief or extended exercise training on the benefit of a dyspnea self-management program in COPD. *Journal of Cardiopulmonary Rehabilitation and Prevention* **25**, 275-284.

Choi E.S. & Lee J. (2012) Effects of a Face-to-face Self-management Program on Knowledge, Self-care Practice and Kidney Function in Patients with Chronic Kidney Disease before the Renal Replacement Therapy. *Journal of Korean Academy of Nursing* **42**, 1070-1078.

Clark A.M. (2013) What are the components of complex interventions in healthcare? Theorizing approaches to parts, powers and the whole intervention. *Social Science & Medicine* **93**, 185-193.

Clark J. (2003) How to peer review a qualitative manuscript. In *Peer review in health sciences* (Godlee F. & Jeferson T. eds.), BMJ Books, London pp. 219-235.

Coster S. & Norman I. (2009) Cochrane reviews of educational and self-management interventions to guide nursing practice: a review. *International Journal of Nursing Studies* **46**, 508-528.

Disler R.T., Gallagher R.D. & Davidson P.M. (2012) Factors influencing self-management in chronic obstructive pulmonary disease: an integrative review. *International Journal of Nursing Studies* **49**, 230-242.

Donesky D., Nguyen H.Q., Paul S.M. & Carrieri-Kohlman V. (2014) The affective dimension of dyspnea improves in a dyspnea self-management program with exercise training. *Journal of Pain and Symptom Management* **47**, 757-771.

Dwarswaard J., Bakker E.J.M., van Staa A. & Boeije H.R. (2016) Self-management support from the perspective of patients with a chronic condition: a thematic synthesis of qualitative studies. *Health Expectations* **19**, 194-208.

Elissen A., Nolte E., Knai C., Brunn M., Chevreul K., Conklin A., Durand-Zaleski I., Erler A., Flamm M., Frolich A., Fullerton B., Jacobsen R., Saz-Parkinson Z., Sarria-Santamera A., Sonnichsen A. & Vrijhoef H. (2013) Is Europe putting theory into practice? A qualitative study of the level of self-management support in chronic care management approaches. *BioMed Central Health Services Research* **13**, 117.

Faradji A., Feugeas O., Chatelus E., Desprez D., Grunebaum L., Gerout A., Blaes C., De Romemont C., El Rifai N. & Nonnenmacher M. (2012) Tailor-made therapeutic education program for hemophilia patients. *Haemophilia* **18**, 54.

Fritz C.O., Morris P.E. & Richler J.J. (2012) Effect size estimates: current use, calculations and interpretation. *Journal of Experimental Psychology: General* **141**, 2.

Gollwitzer PM. (1999) Implementation intentions. Strong effects of simple plans. *American Psychologist*: **54**, 493–503.

Gonzalez A. (2014) Education project to improve venous stasis self-management knowledge. *Journal of Wound, Ostomy and Continence Nursing*, **41**, 556-559.

Goossens E., Van Deyk K., Zupancic N., Budts W. & Moons P. (2014) Effectiveness of structured patient education on the knowledge level of adolescents and adults with congenital heart disease. *European Journal of Cardiovascular Nursing* **13**, 63-70.

Grilo S.A., Shallcross A.J., Ogedegbe G., Odedosu T., Levy N., Lehrer S., Chaplin W. & Spruill T.M. (2015) Food insecurity and effectiveness of behavioral interventions to reduce blood pressure, New York City, 2012-2013. *Preventing Chronic Disease* **12**..

Hagberth V., Sjöberg T. & Ivarsson B. (2008) Older women with a serious cardiac event experience support with a Vifladt & Hopen inspired patient group education programme. *European Journal of Cardiovascular Nursing* **7**, 140-146.

Higgins A., O'Halloran P., & Porter S. (2012) Management of long term sickness absence: a systematic realist review. *Journal of Occupational Rehabilitation* **22**, 322-332.

Higgins, J.P.T., Altman, D.G., Gøtzsche, P.C., Jüni, P., Moher, D., Oxman, A.D., Savović, J., Schulz, K.F., Weeks, L. & Sterne, J.A. (2011) The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *British Medical Journal* **343**, 889-893.

Hoare K.J., Mills J. & Francis K. (2012) The role of Government policy in supporting nurse-led care in general practice in the United Kingdom, New Zealand and Australia: an adapted realist review. Journal of Advanced Nursing **68**, 963-980.

Howden E.J., Coombes J.S., Strand H., Douglas B., Campbell K.L. & Isbel N.M. (2014) Exercise Training in CKD: Efficacy, Adherence and Safety. *American Journal of Kidney Diseases* **65**, 583-591.

Huang T.T., Li Y.T. & Wang C.H. (2009) Individualized programme to promote self-care among older adults with asthma: randomized controlled trial. *Journal of Advanced Nursing* **65**, 348-358.

Huis A., van Achterberg T., de Bruin M., Grol R., Schoonhoven L. & Hulscher M. (2012) A systematic review of hand hygiene improvement strategies: a behavioural approach. *Implementation Science* **7**, 92.

Jagosh J., Pluye P., Wong G., Cargo M., Salsberg J., Bush P.L., Herbert C.P., Green L.W., Greenhalgh T. & Macaulay A.C. (2013) Critical reflections on realist review: insights from customizing the methodology to the needs of participatory research assessment. *Research Synthesis Methods* **5**, 131-141.

Jiang X. & He G. (2012) Effects of an uncertainty management intervention on uncertainty, anxiety, depression and quality of life of chronic obstructive pulmonary disease outpatients. *Research in Nursing & Health* **35**, 409-418..

Jones K.R., Lekhak N. & Kaewluang N. (2014) Using Mobile Phones and Short Message Service to Deliver Self-Management Interventions for Chronic Conditions: A Meta-Review. *Worldviews on Evidence-Based Nursing* **11**(2), 81-88.

Jonsdottir H. (2013) Self-management programmes for people living with chronic obstructive pulmonary disease: a call for a reconceptualisation. *Journal of Clinical Nursing* **22**, 621-637.

Kane S.S., Gerretsen B., Scherpbier R., Dal Poz M., & Dieleman M. (2010) A realist synthesis of randomised control trials involving use of community health workers for delivering child health interventions in low and middle income countries. *BioMed Central Health Services Research* **10**, 286.

Kara M. & Aşti T. (2004) Effect of education on self-efficacy of Turkish patients with chronic obstructive pulmonary disease. *Patient Education and Counseling* **55**, 114-120..

Kaşıkçı M.K. (2011) Using self-efficacy theory to educate a patient with chronic obstructive pulmonary disease: A case study of 1-year follow-up. *International Journal of Nursing Practice* **17**, 1-8.

Kendall E., Ehrlich C., Sunderland N., Muenchberger H. & Rushton C. (2011) Self-managing versus self-management: reinvigorating the socio-political dimensions of self-management. *Chronic Illness* **7**, 87-98.

Kousoulis A.A.., Patelarou E., Shea S., Foss C., Knutsen I.A.R., Todorova E., Roukova P., Portillo M.C., Pumar-Méndez M.J. & Mujika A. (2014) Diabetes self-management arrangements in Europe: a realist review to facilitate a project implemented in six countries. BioMed Central Health Services Research **14**, 1-18.

Kuo C.C., Lin C.C. & Tsai F.M. (2014) Effectiveness of Empowerment-Based Self-Management Interventions on Patients with Chronic Metabolic Diseases: A Systematic Review and Meta-Analysis. *Worldviews on Evidence-Based Nursing*, **11**, 301-315.

Lagger G., Pataky Z., & Golay A. (2010) Efficacy of therapeutic patient education in chronic diseases and obesity. *Patient Education and Counseling* **79**, 283-286.

Lazarus R. S. (1993). Coping theory and research: past, present and future. *Psychosomatic Medicine*, **55**, 234-247.

Lee H., Yoon J.Y., Lim Y., Jung H., Kim S., Yoo Y., Kim Y., Ahn J.J. & Park H.K. (2014) The effect of nurse-led problem-solving therapy on coping, self-efficacy and depressive symptoms for patients with chronic obstructive pulmonary disease: a randomised controlled trial. *Age Ageing* **44**, 397-403.

Leeman J., Chang Y.K., Lee E.J., Voils C.I., Crandell J. & Sandelowski M. (2010) Implementation of antiretroviral therapy adherence interventions: a realist synthesis of evidence. Journal of Advanced Nursing **66**, 1915-1930.

Leone D., Vegni E., Rossetti L.M., Orzalesi N. & Moja E.A. (2012) Improving adherence in glaucoma patients: A systematic review of patient education methods. *Education Therapeutique du Patient/ Therapeutic Patient Education* **3**, 11-20.

Leventhal H., Brissette I. & Leventhal E.A. (2003) The common-sense model of self-regulation of health and illness. In *The self-regulation of health and illness behaviour* (Cameron L.D. & Leventhal H. eds.) Psychology Press, London, pp.42-65.

Lindeman E.C. (1989) *The Meaning of Adult Education. A Classic North American Statement on Adult Education*. Oklahoma Research Center for Continuing Professional and Higher Education, University of Oklahoma, Norman, OK 73037-0003.

Lindskov S., Westergren A. & Hagell P. (2007) A controlled trial of an educational programme for people with Parkinson's disease. *Journal of Clinical Nursing* **16**, 368-376.

Lorig K.R. & Holman H. (2003) Self-management education: history, definition, outcomes and mechanisms. *Annals of Behavioral Medicine*, **26**, 1-7.

Michie S. & Prestwich A. (2010) Are interventions theory-based? Development of a theory coding scheme. *Health Psychology* **29**, 1.

Mogre V., Scherpbier A., Dornan T., Stevens F., Aryee P.A.& Cherry M.G. (2014) A realist review of educational interventions to improve the delivery of nutrition care by doctors and future doctors. Systematic reviews **3**,1.

Monninkhof E., Van der Valk P., Van Der Palen J., Van Herwaarden C. & Zielhuis G. (2003) Effects of a comprehensive self-management programme in patients with chronic obstructive pulmonary disease. *European Respiratory Journal* **22**, 815-820.

Moriyama M., Nakano M., Kuroe Y., Nin K., Niitani M. & Nakaya T. (2009) Efficacy of a self-management education program for people with type 2 diabetes: results of a 12 month trial. *Japan Journal of Nursing Science* **6**, 51-63..

Orem D.E. (1983). *The self-care deficit theory of nursing: A general theory. Family health: A theoretical approach to nursing care*. New York: Willey Medical Publications.

Otsu H. & Moriyama M. (2011) Effectiveness of an educational self-management program for outpatients with chronic heart failure. *Japan Journal of Nursing Science* **8**, 140-152.

Otsu H. & Moriyama M. (2012) Follow-up study for a disease management program for chronic heart failure 24 months after program commencement. *Japan Journal of Nursing Science* **9**, 136-148.

Pawson R., Greenhalgh T., Harvey G. & Walshe K. (2004) *Realist synthesis: an introduction*. ESRC Research Methods Programme, University of Manchester, Manchester.

Pawson R., Greenhalgh T., Harvey G. & Walshe K. (2005) Realist review–a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy* **10**(suppl 1), 21-34.

Pawson R. & Tilley N. (1997) *Realistic evaluation*: Sage, London.

Pope C., Mays N. & Popay J. (2007) *Synthesising Qualitative And Quantitative Health Evidence: A Guide To Methods: A Guide to Methods*: McGraw-Hill Education, Berkshire.

Prochaska J.O., DiClemente C.C., Velicer W.F., Ginpil S. & Norcross J.C. (1985) Predicting change in smoking status for self-changers. *Addictive Behaviors* **10**, 395-406.

Radhakrishnan K. (2012) The efficacy of tailored interventions for self-management outcomes of type 2 diabetes, hypertension or heart disease: a systematic review. *Journal of Advanced Nursing* **68**, 496-510 415p.

Rönning H., Nielsen N.E., Swahn E. & Strömberg A. (2011) Description and initial evaluation of an educational and psychosocial support model for adults with congenitally malformed hearts. *Patient Education and Counseling* **83**, 247-251.

Rootmensen G.N., van Keimpema A.R., Looysen E.E., van der Schaaf L., de Haan R.J. & Jansen H.M. (2008) The effects of additional care by a pulmonary nurse for asthma and COPD patients at a respira-

tory outpatient clinic: results from a double blind, randomized clinical trial. *Patient Education and Counseling* **70**, 179-186.

Ryan R.M., Plant R.W. & O'Malley S. (1995) Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement and dropout. *Addictive Behaviors* **20**, 279-297.

Sarian M., Brault D. & Perreault N. (2011) Self-management support for peritoneal dialysis patients. *CANNT journal= Journal ACITN* **22**, 18-24.

Schenk S. & Hartley K. (2002) Nurse Coach: Healthcare resource for this millennium. *Nursing Forum* **37**, 14-20. Schreurs K.M., Colland V.T., Kuijer R.G., de Ridder D.T. & van Elderen T. (2003) Development, content and process evaluation of a short self-management intervention in patients with chronic diseases requiring self-care behaviours. *Patient Education and Counseling* **51**, 133-141. Sinclair V.G., Wallston K.A., Dwyer K.A., Blackburn D.S. & Fuchs H. (1998) Effects of a cognitive-behavioral intervention for women with rheumatoid arthritis. *Research in Nursing & Health* **21**, 315-326..

Smeulders E.S., van Haastregt J., Ambergen T., Stoffers H.E., Janssen-Boyne J.J., Uszko-Lencer N.H., Gorgels A.P, Lodewijks-van der Bolt C.L.B., van Eijk J.Th.M & Kempen G.I. (2010a) Heart failure patients with a lower educational level and better cognitive status benefit most from a self-management group programme. *Patient Education and Counseling* **81**, 214-221.

Smeulders E.S., Van Haastregt J., Ambergen T., Uszko-Lencer N.H., Janssen-Boyne J.J., Gorgels A.P., Stoffers H.E.J.H., Lodewijks-van der Bolt C.L.B., van Eijk J.Th.M & Kempen G.I. (2010b) Nurse-led self-management group programme for patients with congestive heart failure: randomized controlled trial. *Journal of Advanced Nursing* **66**, 1487-1499.

Song H.Y., Yong S.J. & Hur H.K. (2014) Effectiveness of a Brief Self-Care Support Intervention for Pulmonary Rehabilitation Among the Elderly Patients with Chronic Obstructive Pulmonary Disease in Korea. *Rehabilitation Nursing* **39**, 147-156.

Trappenburg J.C., Niesink A., de Weert-van Oene G.H., van der Zeijden H., van Snippenburg R., Peters A., Lammers J.W.J. & Schrijvers A.J. (2008) Effects of telemonitoring in patients with chronic obstructive pulmonary disease. *Telemedicine and e-Health* **14**, 138-146.

Tsay S.L., Lee Y.C. & Lee Y.C. (2005) Effects of an adaptation training programme for patients with end-stage renal disease. *Journal of Advanced Nursing* **50**, 39-46.

Tu W., Xu G. & Du S. (2015) Structure and content components of self-management interventions that improve health-related quality of life in people with inflammatory bowel disease: a systematic review, meta-analysis and meta-regression. *Journal of Clinical Nursing* **24**, 2695-2709.

Van der Meer V., Bakker M.J., Van den Hout W.B., Rabe K.F., Sterk P.J., Kievit J., Assendelft W. J.J. &. Sont J.K. (2009) Internet-Based Self-management Plus Education Compared With Usual Care in Asthma. A Randomized Trial. *Annals of Internal Medicine* **151**, 110-120.

Van Houtum L, Rijken M, Heijmans M, Groenewegen P. (2013) Self-management support needs of patients with chronic illness: Do needs for support differ according to the course of illness? *Patient Education and Counseling* **93**:626-32.

Van Meijel B., Gamel C., Van Swieten-Duijfjes B. & Grypdonck M. (2004) The development of evidence-based nursing interventions: methodological considerations. *Journal of Advanced Nursing* **48**, 84-92.

Van Os-Medendorp H., Eland-de Kok P., Ros W.J., Bruijnzeel-Koomen C.A. & Grypdonck M. (2007a) The nursing programme 'Coping with itch': a promising intervention for patients with chronic pruritic skin diseases. *Journal of Clinical Nursing* **16**, 1238-1246.

Van Os-Medendorp H., Ros W., Eland-de Kok P., Kennedy C., Thio B., Van der Schuur-van der Zande A., Grypdonck M.H.F. & Bruijnzeel-Koomen C. (2007b) Effectiveness of the nursing programme 'Cop-

ing with itch': a randomized controlled study in adults with chronic pruritic skin disease. *British Journal of Dermatology* **156**, 1235-1244.

Vifladt, E.H., & Hopen, L. (2004) Helsepedagogikk: samhandling om læring og mestring. Oslo: Nasjonalt kompetansesenter for læring og mestring ved kronisk sykdom.

Wagner E.H., Austin B.T., Davis C., Hindmarsh M., Schaefer J. & Bonomi A. (2001) Improving chronic illness care: Translating evidence into action. *Health Affairs* **20**, 64-78.

Whittemore R. & Roy S.C. (2002) Adapting to diabetes mellitus: a theory synthesis. *Nursing Science Quarterly* **15**, 311-317.

WHO (2005) *Preparing a health care workforce for the 21st century: the challenge of chronic conditions*. World Health Organization, Geneva.

Wilkinson A. & Whitehead L. (2009) Evolution of the concept of self-care and implications for nurses: a literature review. *International Journal of Nursing Studies* **46**, 1143-1147.

Williams A., Manias E., Liew D., Gock H. & Gorelik A. (2012) Working with CALD groups: testing the feasibility of an intervention to improve medication self-management in people with kidney disease, diabetes and cardiovascular disease. *Renal Society of Australasia* **8**, 62-69.

Wilson J.S., Fitzsimons D., Bradbury I. & Stuart Elborn J. (2008) Does additional support by nurses enhance the effect of a brief smoking cessation intervention in people with moderate to severe chronic obstructive pulmonary disease? A randomised controlled trial. *International Journal of Nursing Studies* **45**, 508-517.

Wong G., Greenhalgh T., & Pawson R. (2010) Internet-based medical education: a realist review of what works, for whom and in what circumstances. *BioMed Cental Medical Education* **10**, 1-10.

Yardley S., Cottrell E., Rees E. & Protheroe J. Modelling successful primary care for multimorbidity: a realist synthesis of successes and failures in concurrent learning and healthcare delivery. *BioMed Central Family Practice* **16**, 1-21.

Yıldız A.U., & Kurcer M.A. (2012) Life Style Education and Counseling Improved Quality of Life and Renal Function in Patients with Chronic Kidney Disease. *TAF Preventive Medicine Bulletin* **11**, 667-672.

Yu S.H., Guo A.M. & Zhang X.J. (2014) Effects of self-management education on quality of life of patients with chronic obstructive pulmonary disease. *International Journal of Nursing Sciences* **1**, 53-57.

Zoffmann V. (2004) *Guided self-determination. A life skills approach developed in difficult 1 diabetes*. PhD thesis. Aarhus: Faculty of Health Sciences University of Aarhus.

Zoffmann V. & Kirkevold M. (2012) Realizing Empowerment in Difficult Diabetes Care A Guided Self-Determination Intervention. *Quality Health Research* **22**, 103-118.

Zoffmann V. & Lauritzen T. (2006) Guided self-determination improves life skills with type 1 diabetes and A1C in randomized controlled trial. *Patient Education and Counseling* **64**, 78-86.

Supplement 1. Search Strategy

(evaluation/de OR 'evaluation and follow up'/de OR 'evaluation research'/de OR 'nursing evaluation research'/de OR 'self evaluation'/de OR 'comparative effectiveness'/de OR 'clinical effectiveness'/de OR (evaluat* OR effectiv*):ab,ti) AND ('self care'/de OR 'self help'/de OR 'self medication'/de OR 'health education'/de OR 'patient education'/de OR 'coping behavior'/exp OR (((self OR shared) NEAR/3 (manag* OR care* OR medicat* OR efficac*)) OR ((health OR patient*) NEAR/3 (educat*)) OR coping OR resilien* OR ((psycholog* OR behav*) NEAR/3 (adapt* OR adjust*))):ab,ti) AND ('chronic disease'/de OR 'genetic and familial disorders'/exp OR 'congenital disorder'/exp OR (((chronic* OR longterm OR 'long term' OR 'end stage' OR endstage* OR degenerat* OR persisten* OR genetic* OR familial* OR congenit*) NEAR/3 (ill* OR disease* OR condition* OR disorder*))):ab,ti) AND (nursing/exp OR nurse/exp OR 'nursing staff'/de OR 'nursing education'/exp OR 'nurse attitude'/de OR 'nurse patient relationship'/de OR 'nurse training'/de OR (nurs*):ab,ti) NOT ((child/exp OR pediatrics/exp OR (child* OR pediatric* OR paediatric*):ab,ti) NOT (adult/de OR 'middle aged'/de OR aged/de OR adult*:ab,ti))

Supplement 2. Table Quality appraisal

Items of quality appraisal	Risk of Bias (RCT's)[a]						Quality other quantitative studies[b]						Quality of qualitative studies[c]								
Author(s); year of publication; country	Adequate sequence generation	Allocation concealment	Blinding	Incomplete data addressed	Free of selective reporting	Free of other bias	Design of study	Content (description intervention)	Sample size	Validity and reliability of instruments	Test statistics	Significance	Research question	Qualitative method	Sample & recruitment	Sample characteristics	Data collection	Procedure/ ethics	Analysis	Results: interpretation	Conclusion & discussion	Overall picture
Akyil & Ergüney (2012), Turkey							1	1	1	1	1	1										
Bakan & Akyol (2007), Turkey	0	0	0	+	0	0																
Balk et al. (2008), The Netherlands	+	+	0	0	0	-																
Carrieri-Kohlman et al. (2005), USA							1	1	0	1	1	1										
Choi & Lee (2012), Korea	0	0	+	0	0	-																
Donesky et al. (2013), USA	0	0	+	+	0	0																
Gonzalez et al. (2014), USA							0	1	0	0	1	0										
Goossens et al. (2014), Belgium							0	1	0	1	1	1										
Grilo et al. (2015), USA							1	1	0	0	1	0										
Hagberth et al. (2008), Sweden													3	3	3	3	3	3	3	3	2	3
Howden et al. (2015), Australia	+	+	0	+	0	-																
Huang et al. (2008), Taiwan	+	+	+	+	0	0																
Jiang & He (2012), China	0	0	+	+	0	-																
Kara & Asti (2003), Turkey	-	-	+	+	0	0																
Kasikci (2010), Turkey							0	1	0	1	1	0										
Lee et al. (2014), South Korea	0	0	+	+	0	0																
Lindskov et al. (2007), Sweden							1	0	0	1	1	1										
Monninkhof et al. (2003), The Netherlands	+	+	0	+	0	+																
Moriyama et al. (2009), Japan	0	0	0	+	0	-																
Otsu & Moriyama (2011) & (2012), Japan	+	0	+	+	0	0																

Supplement 2. Table Quality appraisal (*continued*)

Items of quality appraisal	Risk of Bias (RCT's)[a]						Quality other quantitative studies[b]						Quality of qualitative studies[c]									
Author(s); year of publication; country	Adequate sequence generation	Allocation concealment	Blinding	Incomplete data addressed	Free of selective reporting	Free of other bias	Design of study	Content (description intervention)	Sample size	Validity and reliability of instruments	Test statistics	Significance	Research question	Qualitative method	Sample & recruitment	Sample characteristics	Data collection	Procedure/ ethics	Analysis	Results: interpretation	Conclusion & discussion	Overall picture
Ronning et.al. (2013), Sweden							0	1	0	0	0	0										
Rootmensen et al. (2008), The Netherlands	+	+	+	+	0	+																
Sarian et al. (2012), Canada							0	1	0	0	0	0										
Scheurs et al. (2003), The Netherlands							0	1	0	1	1	1										
Smeulders et al. (2010a/b), The Netherlands	+	+	+	+	+	+																
Trappenburg et al. (2008), The Netherlands							1	1	0	1	1	1										
Tsay et al. (2005), Taiwan	0	0	+	+	0	0																
Van der Meer et al. (2009), The Netherlands	+	+	0	+	+	0																
Van Os-Medendorp et al. (2007a/2007b), The Netherlands	0	0	0	+	0	0							3	3	3	3	2	3	1	1	2	3
Williams et al. (2012), Australia	+	+	+	+	0	-																
Wilson et al. (2008), Ireland	+	+	0	+	0	0																
Yildiz & Kurcer (2012), Turkey							0	1	0	1	1	1										
Yu et al. (2014), China							1	1	0	1	1	1										
Zoffman & Kirkevold (2012), Denmark													4	4	2	4	4	4	3	3	4	4
Zoffman & Lauritzen (2006), Denmark	+	-	-	+	0	0																

[a] Risk of bias according to Cochrane's tool for assessing risk of bias: + = low risk of bias; - = high risk of bias; 0 = uncertain risk of bias

[b] Quality rating according to Huis et al. (2012)

[c] 1= Not at all/ 2= A little/ 3= Reasonable/ 4= Very

Supplement 3. Table Overview of selected studies with effect sizes (in alphabetical order by first author)

Author(s); year of publication	*Design*	*Theory mentioned in study*	*Patient group characteristics (n; diagnosis)*
Akyil & Ergüney (2012)	Quasi experimental design with control group	Roy's Adaptation Model	n=65 Chronic Obstructive Pulmonary Disease (COPD)
Bakan & Akyol (2007)	RCT	Roy's Adaptation Model	n= 43 Chronic Heart Failure (CHF)
Balk et al. (2008)	RCT	Not mentioned	n=214 CHF
Carrieri-Kohlman et al. (2005)	Prospective, randomized single-blind trial	Social cognitive theory	n=103 COPD
Choi & Lee (2012)	RCT	Not mentioned	n=61 Chronic Kidney Disease (CKD)
Donesky et al. (2013)	RCT	Social cognitive theory	n=115 COPD
Gonzalez et al. (2014)	Single-group before after design	Orem's theory of self-care	n=30 Venous ulcers
Goossens et al. (2014)	Descriptive, cross-sectional study	Not mentioned	n=317 Congenital heart disease (CHD)
Grilo et al. (2015)	Pilot clinical trial	Chronic Care Model	n=28 Uncontrolled hypertension and comorbid Diabetes Mellitus (DM) type 2
Hagberth et al. (2008)	Qualitative descriptive study	Vifland & Hopen model	n=13 Asthma
Howden et al. (2015)	RCT	Not mentioned	n=83 CKD

	Outcomes Hedges (G)[a] *- Knowledge* *- Behavioural change* *- Skills* *- Coping* *- Self-efficacy* *Only reported / calculated if measured in the original study*	*Outcomes Hedges (G)*[a] *- Clinical outcomes* *- Quality of Life* *Only reported / calculated if measured in the original study*
	Coping Adaptation Physiological adaptation 4.93 (3.95 - 5.91) Self-concept-physical self-adaptation: 4.82 (3.86 - 5.78) Self-concept-personal self-adaptation: 3.78 (2.97 - 4.59) Role-function mode: 4.53 (3.61 - 5.45) Perceived social support from friends 1.16 (0.63 - 1.68) Perceived social support from family: 0.37 (-0.12 - 0.86)	
	Coping Social Support: 1.48 (0.81 – 2.16)	Cholesterol 0.25 (-0.35 – 0.85) High-density lipoprotein (HDL) 0.20 (-0.40 – 0.80) Low-density lipoprotein (LDL) 3.47 (2.53 – 4.42)
	Knowledge 1.26 (0.71 – 1.81) Behavioural change (self-care) 0.07 (-0.43 – 0.57)	Blood Urea Nitrogen (BUN) 0.38 (-0.12 – 0.89) Creatinine (C) 0.45 (-0.06 – 0.95) Sodium (Na) 0.33 (-0.17 – 0.84) Potassium (K) 0.24 (-0.26 – 0.75) Calcium (Ca) 0.11 (-0.39 – 0.62) Phosphate (P) 0.20 (-0.31 – 0.71) Haemoglobin (Hb) 0.18 (-0.33 – 0.68) Glomerular Filtration Rate (GFR) -0.48 (-0.92 – 0.09)
		Exercise capacity 0.73 (0.24 - 1.23) Heart rate -0.53 (- 1.02 -0.04) Systolic blood pressure – 0.04 (-0.52 – 0.44) Diastolic blood pressure -0.09 (-0.57 – 0.39)

Supplement 3. Table Overview of selected studies with effect sizes (in alphabetical order by first author) (*continued*)

Huang et al. (2008)	RCT	Not mentioned	n=148 Asthma
Jiang & He (2012)	RCT	Transitional model of stress and coping	n=96 COPD
Kara & Asti (2003)	RCT	Social Cognitive Theory	n=60 COPD
Kaşıkçı (2010)	Case-study	Social cognitive theory	n=1 COPD
Lee et al. (2014)	RCT	No specific theoretical framework	n=151 COPD
Lindskov et al. (2007)	Naturalistic non-randomized waiting list controlled trial	No specific theoretical framework	n=48 Parkinson's Disease
Monninkhof et al. (2003)	RCT	Not mentioned	n=248 COPD
Moriyama et al. (2009)	RCT	Theory of cognitive behaviour	n=65 DM type 2
Otsu & Moriyama (2011)	RCT	Theory of cognitive behaviour	n=102 CHF Retired elderly persons
Otsu & Moriyama (2012), Japan	RCT	Theory of cognitive behaviour	n=94 CHF Retired elderly persons

	1st value = Education/ 2nd value = Education + PFM Knowledge 1.45 (1.00 - 1.89) / 1.53 (1.08 – 1.97) Behavioural change (self-care behaviours 1.68 (1.22 – 2.14) / 2.42 (1.90 – 2.94) Skills 0.23 (-0.17 – 0.62) / 0.33 (-0.07 – 0.73) Coping (asthma control indicator) -0.08 (-0.48 – 0.31) / 0.10 (-0.30 – 0.49) Self-efficacy 1.14 (0.72 – 1.57) / 1.94 (1.47 – 2.42)	Peak expiratory flow rate 0.17 (-0.23 – 0.56) 0.52 (0.12 –0.92) FVC 0.44 (0.04 – 0.83) 0.38 (-0.02 – 0.78) Pre-bronchodilation FEV1 0.24 (-0.15 – 0.64) 0.08 (-0.32 – 0.47) * FEV1/FVC 0.01 (-0.38 – 0.41) 0.09 (-0.30 – 0.48) Post- bronchodilation FEV1 0.15 (-0.25 – 0.54) 0.10 (-0.29 – 0.49) FEV1/FVC 0.06 (-0.34 – 0.45) 0.03 (-0.36 – 0.43)
	Coping self-statement 0.33 (-0.08 - 0.73) Praying/hoping -0.05 (-0.46 - 0.35) Ignoring 0.25 (-0.15 - 0.65) Increasing behavioural activities 0.25 (-0.15 - 0.65) Catastrophizing -0.20 (-0.60 - 0.20) Diversion of attention 0.40 (-0.01 - 0.80)	Health related quality of life Physical 0.08 (-0.31 - 0.48) Mental health 0.38 (-0.02 - 0.79)
	Self-efficacy 1.93 (1.32 – 2.54)	
	Problem-oriented coping 0.08 (-0.24 - 0.40) COPD self-efficacy 0.13 (-0.19 – 0.45)	Depressive symptoms 0.16 (-0.16 - 0.48)
		Quality of life Physical component = 0.08 (-0.32 - 0.48) Mental component = 0.31 (-0.09 - 0.71) Difference in daily dopaminergic drug therapy: -0.29 (-0.69 - 0.11)
		Health Related Quality of Life (total) = -0.10 (-0.43 - 0.08)
	Quit smoking 0.18 (-0.22 – 0.59) Quit drinking 0.02 (-0.39 – 0.42) Symptom deterioration 0.24 (-0.17 – 0.64)	Systolic blood pressure 0.31 (-0.10 – 0.72) Diastolic blood pressure 0.23 (-0.17 – 0.64) Pulse pressure 0.27 (-0.13 – 0.68) Heart function level, Grade II 0.08 (-0.32 – 0.48) Heart function level, Grade III 0.44 (0.03 – 0.85) Ankle oedema 0.29 (-0.11 – 0.70) Shortness of breath 0.46 (0.05 – 0.87) Health-Related Quality of Life 0.74 (0.32 – 1.16) Compliance: Sodium restriction 0.88 (0.45 – 1.30) Medicine 0.29 (-0.11 – 0.70) Activities/ exercises 2.10 (1.59 – 2.60) Weight-monitoring 0.00 (-.040 – 0.40)
		Systolic blood pressure 0.17(-0.26 - 0.60) Diastolic blood pressure 0.04 (-0.40 - 0.47) Pulse pressure 0.19 (-0.25 - 0.62) Brain Peptide 0.32 (-0.12 - 0.76)

Supplement 3. Table Overview of selected studies with effect sizes (in alphabetical order by first author) (*continued*)

Ronning et.al. (2013)	Single group before- after design	Theory of constructivism	n=55 Congenitally malformed hearts
Rootmensen et al. (2008)	RCT	Not mentioned	n=191 COPD
Sarian et al. (2012)	Single group before after test	Chronic Care Model	n=10 Peritoneal dialysis patients
Scheurs et al. (2003)	Single group before-after design	Self-regulation model & proactive coping theory	n=83 Asthma, DM, and CHF
Smeulders et al. (2010a/b)	RCT	Social Cognitive Theory	n=317 Congestive heart failure
Trappenburg et al. (2008)	Non randomized controlled multicenter study	Not mentioned	n=115 COPD
Tsay et al. (2005)	RCT	Transitional model of stress and coping	n=57 End-stage renal disease
Van der Meer et al. (2009)	RCT	Not mentioned	n=200 Asthma
Van Os-Medendorp et al. (2007a)	Mixed-methods	Coping strategies	n=65 Chronic pruritic skin disease
Van Os-Medendorp et al. (2007b)	RCT	Coping strategies	n=65 Chronic pruritic skin disease
Williams et al. (2012)	RCT	Health Belief Model	n=78 CKD, DM, and cardiovascular disease
Wilson et al. (2008)	RCT	Theory of Planned Behaviour & stage of change	n=91 COPD

	Knowledge 0.00 (-0.31 - 0.31) Coping 0.04 (-0.27 - 0.35) Skills: Inhalation technique 0.45 (0.12 - 0.78)	
	General self-efficacy -0.04 (-0.26 - 0.18) Cardiac self-efficacy 0.06 (-0.16 - 0.29) Perceived control -0.09 (-0.31 - 0.13) Cognitive symptom management (CSM) 0.11 (-0.11 - 0.33) Self-care behaviour: 0.00 (-0.22 - 0.22)	Cardiac-specific QOL Total -0.12 (-0.35 - 0.10) Physical -0.07 (-0.29 - 0.16) Mental -0.09 (-0.31 - 0.14) Perceived control -0.15 (-0.37 - 0.07) Symptoms of anxiety 0.16 (-0.07 - 0.38) Symptoms of depression -0.24 (-0.46 - -0.01)
		Quality of life -0.26 (-0.63 - 0.11) No. Exacerbations 0.26 (-0.11 - 0.62)
	Coping Stressor severity 0.14 (-0.38 - 0.66) Physical stressors associated with haemodialysis 0.18 (-0.34 - 0.70) Psychological stressors associated with haemodialysis 0.12 (-0.40 - 0.64).	Mental Quality of Life 0.32 (-0.08 - 0.97) Physical Quality of life 0.44 (-0.08 - 0.97)
	Itch-related coping Catastrophizing and helpless coping 0.28 (-0.27 - 0.84) Problem-focused coping 0,17 (-0.39 - 0.72) Skin Related psychosocial morbidity 0.02 (-0.53 - 0.57) General Psychosocial morbidity 0.47 (-0.08 - 1.02)	
	Frequency of itching/scratching 0.34(-0.16 - 0.83). Intensity of itching/ scratching 0.41 (-0.09 - 0.90) Catastrophizing and helpless coping 0.32 (-0.13 - 0.78) Problem-focused coping 0.09 (-0.37 - 0.54) Skin related psychosocial morbidity 0.25 (-0.21 - 0.70)	Quality of life 0.08 (-0.37 - 0.54)

Supplement 3. Table Overview of selected studies with effect sizes (in alphabetical order by first author) (*continued*)

Yildiz & Kurcer (2012)	Single-group before-after design	Not mentioned	n=84 CKD
Yu et al. (2014)	Non-randomized controlled trial	Social Cognitive Theory	n=84 COPD
Zoffman & Kirkevold (2012)	Qualitative evaluation study	Life skills & Empowerment	n=50 DM type 1
Zoffman & Lauritzen (2006)	RCT	Empowerment & trans-theoretical stage of change theory	n=30 DM type 1

[a] Effect sizes of 0.2 were interpreted as small, 0.5 as medium, and 0.8 as large (Fritz et al., 2012)

	Behavioural change: Cigarette (number in a day): 0.25 (-0.05 - 0.55) Alcohol (glass in a week): 0.02 (-0.28 - 0.32) Exercise duration (minute a day): 5,75 (5.06 - 6.43)	Quality of life (total) 0.92 (0.60 - 1.23) Serum Albumin (g/dl) 0.69 (0.38 - 1.01) Serum Urea 0.43 (0.13 - 0.74) Serum creatinine 0.33 (0.02 - 0.63) Tension: Systolic 0.92 (0.60 - 1.23) Diastolic 0.69 (0.38 - 1.01)
		Health related quality of life 0.77 (0.32 – 1.21)
	Behavioural change: Perceived autonomy support 4.18 (3.18 – 5.17) Treatment self-regulation: Autonomous 1.66 (1.01 – 2.32) Diabetes related problems 3.10 (2.27 – 3.93)	

:Supplement 4. Table Context, mechanism, outcome of self-management interventions

String	Context	Mechanism	Outcome
A) Knowledge leads to Behavioural change (Balk et al. 2008, Rootmensen et al. 2008, Huang et al. 2009, Moriyama et al. 2009, Trappenburg et al. 2008, Wilson et al. 2008, Van der Meer et al. 2009, Otsu & Moriyama 2011, Rönning et al. 2011, Choi & Lee 2012, Otsu & Moriyama 2012, Yıldız & Kurcer 2012, Gonzalez 2014, Goossens et al. 2014, Howden et al. 2014, Yu et al. 2014, Grilo et al. 2015)	*Motivation of patients* Recalcitrant smokers with little confidence in a new attempt to quit smoking, who lack symptoms of dyspnoea at the time of the intervention and live with another smoker, and health illiterate food-insecure patients whose food choices are culturally influenced	*Knowledge* Providing education about the chronic condition, the risk of smoking or unhealthy food, and how to use medication.	*Behavioural change* These interventions did not lead to behavioural change (Wilson et al. 2008, Grilo et al. 2015).
	Difficult patients Patients with less education and visual impairment included in study, 'difficult' patients	*Knowledge* Re-enforcement education, in which the nurse repeated the information during multiple consultation sessions or follow-up telephone calls, and answered individual questions.	*Behavioural change* This intervention enabled patients to adjust the information to their own situation – which in turn led to a change in behaviour (Huang et al. 2009).
	Recently diagnosed patients Recently diagnosed patients with chronic heart failure	*Knowledge* Providing feedback about patients' knowledge by self-monitoring.	*Behavioural change* These interventions stimulated learning and led to knowledge gain. Patients learned to recognize warning signs by which they would change their behaviour (Balk et al. 2008, Huang et al. 2009).
	Motivation of patients Patients who feel relatively well and who are capable of self-care	*Knowledge* Providing feedback about patients' knowledge through self-monitoring and measurement devices	*Behavioural change* This intervention did not have a surplus value for this group (Balk et al. 2008).

Supplement 4. Table Context, mechanism, outcome of self-management interventions (*continued*)

String	Context	Mechanism	Outcome
B) Knowledge leads to Coping (Monninkhof et al. 2003, Schreurs et al., 2003, Tsay et al. 2005, Lindskov et al. 2007, Van Os-Medendorp et al. 2007a, Van Os-Medendorp, et al. 2007b, Bakan & Akyol 2008, Hagberth et al. 2008, Sarian et al. 2011, Jiang & He 2012, Akyil & Ergüney 2013)	*Patients in a homogeneous group*	*Knowledge* Sharing experiences and knowledge with peers	*Coping* This made patients feel acknowledged. They were able to adjust the information to their own situation when they shared information about lifestyle or exercise. It was successful for some topics (Bakan & Akyol 2008, Hagberth et al. 2008; Sarian et al. 2011).
	Undefined context Patients with various chronic conditions, both group and individual interventions	*Knowledge* Patients were provided with information about the disease, its symptoms and strategies to deal with symptoms.	*Coping* Patients learned to reinterpret the situation and thus were better able to cope with the disease (Monninkhof et al. 2003, Schreurs et al. 2003, Tsay et al. 2005, Lindskov et al. 2007, Bakan & Akyol 2008, Jiang & He 2012, Akyil & Ergüney 2013).
	Involvement of relatives	*Knowledge* Relatives were involved in the intervention.	*Coping* Patients were better supported in their daily lives (Monninkhof et al. 2003, Bakan & Akyol 2008, Sarian et al. 2011).
	Patients in a homogeneous group Patients with peritoneal dialysis in a group with fellow patients	*Knowledge* Discussing scenarios with peers	*Coping* Patients learned what to do in certain circumstances (Sarian et al. 2011).
	Patients with various chronic conditions in groups	*Knowledge* Patients who kept a diary to monitor progress became aware of their responses in certain situations, but	*Coping* Participants were disappointed if goals could not be reached quickly enough (Schreurs et al. 2003, Tsay et al. 2005).

Supplement 4. Table Context, mechanism, outcome of self-management interventions (*continued*)

String	Context	Mechanism	Outcome
C) Knowledge leads to Self-efficacy (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Smeulders et al. 2010a, Smeulders et al. 2010b, Kaşıkçı, 2011, Donesky et al. 2014)	*Undefined context* Patients with COPD in individual counselling sessions	*Knowledge* Patients were encouraged to discuss everyday disease related problems.	Coping Patients learned to reinterpret the situation, confidence to deal with the disease increased (Kaşıkçı 2011, Donesky et al. 2014).
	Patients in a homogeneous group Patients in a group with fellow patients or relatives	*Knowledge* Patients shared experiences and knowledge about living with the chronic condition.	*Behavioural change* Patients felt acknowledged and were provided with practical ready-to-use information. This led to reinterpretation of the situation, and to greater confidence to deal with the disease (Kara & Aşti, 2004, Smeulders et al. 2010a, Smeulders et al., 2010b).
D) Skills enhancement leads to Behavioural change (Rootmensen et al. 2008, Wilson et al. 2008, Huang et al. 2009, Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012)	*Motivation of patients* Patients who are poorly motivated to stop smoking	*Skills* Patients discussed with nurses how to quit smoking and to set goals, the nurse encouraged the patient.	*Behavioural change* This discussion served as a cue to action for patients (Wilson et al. 2008, Moriyama et al. 2009).
	Undefined context Patients with asthma	*Skills* Patients learned to monitor their condition.	*Behavioural change* The monitoring led to self-care behaviour (Huang et al. 2009).
	Involvement of relatives Patients with chronic conditions, with involvement of family	*Skills* Family received instructions about skills which the patient should master, then they could support the patient in this process	*Behavioural change* This did not in all studies help the patients to change their behaviour (Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012).

Supplement 4. Table Context, mechanism, outcome of self-management interventions (*continued*)

String	Context	Mechanism	Outcome
E) Skills enhancement leads to Coping (Monninkhof et al. 2003, Schreurs et al. 2003, Tsay et al. 2005, Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007b, Jiang & He 2012, Lee et al. 2014)	*Undefined context* Patients with chronic conditions.	*Skills* Learning practicing breathing techniques, pleasant imagery and distraction.	*Coping* The learned skills helped patients to cope with disease related problems (Van Os-Medendorp et al. 2007a, Van Os-Medendorp et al. 2007b, Jiang & He 2012).
	Patients in a homogeneous group Patients with chronic conditions in homogenous groups of fellow patients	*Skills* Discussing personal goals with fellow patients	*Coping* Discussing personal goals led to advice, support, and pointing out unrealistic goals by these fellow patients (Schreurs et al. 2003, Tsay et al. 2005).
	Patients in a homogeneous group	*Skills* Practicing skills in a group with fellow patients	*Coping* This encouraged patients to try these skills, which gave increased confidence (Schreurs et al. 2003, Tsay et al. 2005)
F) Skills enhancement leads to Self-efficacy (Kara & Aşti, 2004, Carrieri-Kohlman et al. 2005, Smeulders et al. 2010a, Smeulders et al. 2010b, Kaşıkçı 2011, Donesky et al. 2014)	*Undefined context* Patients with COPD	*Skills* Training and gradual exposure to a fearful stimulus	*Self-efficacy* This gave patients not always an increase of confidence of being in control of their breathing (Carrieri-Kohlman et al. 2005, Kaşıkçı 2011, Donesky et al. 2014).
	Patients in a homogeneous group Patients with COPD in homogenous groups	*Skills* Patients practicing in groups and seeing other patients perform exercises	*Self-efficacy* Patients gained greater confidence of being able to perform these exercises (Kara & Aşti 2004).
	Undefined context Patients with COPD	*Skills* Patients who received feedback from nurses on their improvements, who did daily exercises and mastered gradual steps,	*Self-efficacy* Patients persevered in their behaviour (Carrieri-Kohlman et al. 2005, Kaşıkçı, 2011, Donesky et al. 2014).

Supplement 4. Table Context, mechanism, outcome of self-management interventions (*continued*)

String	Context	Mechanism	Outcome
G) Motivation leads to Behavioural change (Zoffmann & Lauritzen, 2006, Williams et al. 2012, Zoffmann & Kirkevold 2012)	*'Difficult patients'* Patients with poorly controlled diabetes	*Motivation* Reflection of patients on their problems in controlling the diabetes.	*Behavioural change* Patients became aware of their own role in controlling the diabetes, and they showed more involvement during the consultations (Zoffmann & Lauritzen 2006, Zoffmann & Kirkevold 2012).
	'Difficult patients' Patients with poorly controlled diabetes	*Motivation* Reflection by patients and nurses on the difficulties of living with diabetes.	*Behavioural change* This intervention led to patients' internal motivation to achieve their goals, and to an actual change of behaviour (Zoffmann & Lauritzen 2006, Zoffmann & Kirkevold 2012).
	Culturally and linguistically diverse groups and Involvement of relatives	*Motivation* Using interpreters and family	*Behavioural change* The use of interpreters and family made that patients regarded the session as helpful and enjoyed learning about their conditions in their preferred language, but it did not automatically lead to a change of behaviour (Williams et al. 2012).
	Culturally and linguistically diverse groups with multiple chronic conditions	*Motivation* Using interpreters	*Behavioural change* Patients learning in their own language stimulated patients to learn about their condition, but did not lead to a behavioural change (Williams et al. 2012).

Supplement 5. Table Components of self-management support interventions

	Components		
A) Knowledge leads to behavioural change	Brief medical advice (Wilson et al. 2008) Computer-based education / CD (Rönning et al. 2011) Computerized intake form/checklist (Goossens et al. 2014) Diary records (Yu et al. 2014) Daily biomedical self-measurements (Balk et al. 2008, Huang et al. 2009) Educational group sessions (with fellow patients and/or relatives)(Wilson et al. 2008, Van der Meer et aL.2009, Choi & Lee 2012) Feedback from monitoring device (Trappenburg et al. 2008) Individualized education plan (Balk et al. 2008, Wilson et al. 2008, Yu et al, 2014) Individualized face-to-face education sessions (Rootmensen et al. 2008, Wilson et al. 2008, Huang et al. 2009, Moriyama et al. 2009, Otsu & Moriyama 2011, Choi & Lee 2012, Otsu & Moriyama 2012, Yıldız & Kurcer 2012, Gonzalez 2014, Goossens et al. 2014, Yu et al. 2014, Howden et al. 2015)	Knowledge questionnaire (Rönning et al. 2011) Letter to the family describing ways to assist patients (Otsu & Moriyama 2011, Otsu & Moriyama 2012) Medication and appointment reminders (Grilo et al. 2015) Monitoring by healthcare professional (Yıldız & Kurcer 2012) Motivational interviewing (Grilo et al. 2015) Patient education brochure (Wilson et al. 2008, Huang et al. 2009, Gonzalez 2014) Personal targets (Grilo et al. 2015) Personalized daily questions (Trappenburg et al. 2008) Personalized feedback (Van der Meer et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012)	Phone calls (Huang et al. 2009, Moriyama et al. 2009, Yu et al. 2014, Grilo et al. 2015) Presentation (Choi & Lee, 2012, Gonzalez 2014) Relatives attend sessions/involvement (Moriyama et al. 2009, Yu et al. 2014) Self-monitoring (Huang et al. 2009, Van der Meer et al. 2009, Otsu & Moriyama, 2011; Otsu & Moriyama 2012,) Telemonitoring (Grilo et al. 2015, Trappenburg et al. 2008) Textbook (Otsu & Moriyama 2011, Otsu & Moriyama 2012, Yu et al. 2014) Text messaging (Yu et al. 2014) TV-channel (Balk et al. 2008) Web-based education (Van der Meer et al. 2009)
B) Knowledge leads to coping	Audio CD (Jiang & He 2012) Awareness training by use of diary (Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b) Bank of topics patients want to discuss, which could be used during the meetings (Hagberth et al. 2008) Booklet with information about (adaptation of) the illness (Monninkhof et al. 2003, Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b, Akyil & Ergüney 2013) Case studies (Sarian et al. 2011) Crossword puzzle (Bakan & Akyol 2008)	Educational group sessions (with fellow patients and/or relatives) (Monninkhof et al. 2003, Schreurs et al. 2003, Tsay et al. 2005, Lindskov et al. 2007, Bakan & Akyol 2008, Hagberth et al. 2008, Sarian et al. 2011) Experienced layman from patient association (Hagberth et al. 2008) Home work (Schreurs et al. 2003) Individualized face-to-face education (Lindskov et al. 2007, Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b, Bakan & Akyol 2008, Sarian et al. 2011, Akyil & Ergüney 2013)	Patient workbook (Schreurs et al. 2003) Peer support (fellow patients) (Tsay et al. 2005, Bakan & Akyol 2008, Sarian et al. 2011) Phone calls (Bakan & Akyol 2008, Jiang & He 2012, Akyil & Ergüney 2013) Self-help manual (Jiang & He 2012) Peer support group for family members (Lindskov et al. 2007) Patient education brochure (Bakan & Akyol 2008) Weekly biomedical self-measurements (Monninkhof et al. 2003)

Supplement 5. Table Components of self-management support interventions (*continued*)

	Components		
C) Knowledge leads to self-efficacy	Educational group sessions (with fellow patients and/or relatives) (Smeulders et al. 2010)	Individualized face-to-face education sessions (Carrieri-Kohlman et al. 2005, Donesky et al. 2014) Patient education brochure (Kara & Aşti 2004, Kaşıkçı 2011)	Repeated structured education according to needs (Kaşıkçı 2011) Telephone calls (Kaşıkçı 2011)
D) Skills enhancement leads to behavioural change	Booklet with exercise instructions (Howden et al. 2015) Calendar to monitor body measurements (Otsu & Moriyama 2011, Otsu & Moriyama 2012) Check and correct skills (Rootmensen et al. 2008) Daily exercises (home work) (Moriyama et al. 2009) Face-to-face instruction (Rootmensen et al. 2008, Wilson et al. 2008, Huang et al. 2009)	Group support (Wilson et al. 2008) Home-based training (Howden et al. 2015) Personal targets (Moriyama et al. 2009, Otsu & Moriyama 2011, Otsu & Moriyama 2012) Personalized feedback (Moriyama et al. 2009) Monitoring health status (Howden et al. 2015)	Motivational interviewing (Moriyama et al. 2009, Williams et al. 2012) Phone calls (Grilo et al. 2015, Howden et al. 2015) Record keeping of daily practice (Moriyama et al. 2009) Self-monitoring by using a scale (Huang et al. 2009) Supervised exercise training (Howden et al. 2015)
E) Skills enhancement leads to coping	Diary records (Tsay et al. 2005, Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b) Group counselling and support (Monninkhof et al. 2003) Individual counselling and support (Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b) Individualized action plan (Schreurs et al. 2003, Lee et al. 2014) Instruction booklet (Monninkhof et al. 2003, Jiang & He 2012, Lee et al. 2014)	Motivational interviewing (Os-Medendorp et al. 2007a, Os-Medendorp et al. 2007b) Patient workbook (Schreurs et al. 2003) Peer support (fellow patients) (Schreurs et al. 2003, Tsay et al. 2005) Phone calls (Jiang & He 2012, Lee et al. 2014) Practicing techniques (Tsay et al. 2005) Self-help manual (Jiang & He 2012)	Self-treatment action plan (Monninkhof et al. 2003) Supervised training and workout sessions (Monninkhof et al. 2003) Tools (eg. laminated cards describing the steps to relax and use calming self-talk) (Jiang & He 2012) Verbal reinforcement and encouragement (Lee et al. 2014)

Supplement 5. Table Components of self-management support interventions (*continued*)

	Components		
F) Skills enhancement leads to self-efficacy	Coaching during exercise (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Donesky et al. 2014) Goal setting (Smeulders et al. 2010) Group support (Kara & Aşti, 2004, Smeulders et al. 2010) Home exercise (Donesky et al. 2014)	Individualized action plan (Smeulders et al. 2010) One-to-one classes with telephone interviews (Kaşıkçı 2011) Phone calls (Carrieri-Kohlman et al. 2005) Personalized feedback (Smeulders et al. 2010, Donesky et al. 2014)	Personal targets (Kara & Aşti 2004) Record keeping of daily practice (Carrieri-Kohlman et al. 2005; Donesky et al. 2014) Supervised training and workout sessions (Kara & Aşti 2004, Carrieri-Kohlman et al. 2005, Kaşıkçı 2011, Donesky et al. 2014)
G) Motivation leads to behavioural change	Group support (Zoffmann & Lauritzen 2006) Individualized medication review (Williams et al. 2012) Interpreters (Williams et al. 2012)	Motivational interviewing (Williams et al. 2012) Personal targets (Zoffmann & Lauritzen 2006, Williams et al. 2012) Phone calls (Williams et al. 2012)	Presentation (in patients' own language) (Williams et al. 2012) Reflection sheets (Zoffmann & Lauritzen 2006, Zoffmann & Kirkevold 2012)