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## **Title**

# **Nurses' role in cardiovascular risk assessment and management in people with inflammatory arthritis: A European perspective.**

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## **ABSTRACT**

### **Introduction**

Cardiovascular risk (CVR) assessment and management in patients with inflammatory arthritis (IA) is recommended, but European nurses' involvement in this role has not been well-studied.

### **Aim**

To explore European nurses' role in assessing and managing CVR, in order to suggest topics for practice development and research in this area regarding persons with IA.

### **Methods**

We searched Embase, Cinahl, Cochrane, PsycInfo and PubMed databases and included European articles from the past 10 years if they described how nurses assess and/or manage CVR. In addition to the systematic review, we provided case studies from five different countries to illustrate national guidelines and nurses' role regarding CVR assessment and management in patients with IA.

### **Results**

Thirty-three articles were included. Trained nurses are undertaking CVR assessment and management in different settings and groups of patients. The assessments include blood pressure, body mass index, waist circumference, glucose and lipid-profile, adherence to medication and behavioural risk factors (unhealthy diet, physical inactivity, alcohol and smoking). Different tools were used to calculate the patients' risk. Risk management differed from brief advice to long-term follow-up. Nurses tend to take a holistic and individually tailored approach. Clinical examples of inclusion of rheumatology nurses in these tasks are scarce.

### **Conclusion**

Nurses undertake CVR assessment, communication and management in different types of patients. This is considered to be a highly relevant task for rheumatology nursing, especially in patients with IA. Further studies are needed to assess the patients' perspective, effectiveness and cost-effectiveness of nurse-led CVR.

**Keywords:** Inflammatory arthritis, cardiovascular risk, nurse-led, consultations

## INTRODUCTION

It is well known that people with rheumatoid arthritis (RA) have higher mortality compared to the general population and primarily due to an increased risk of cardiovascular (CV) events (Avina-Zubieta et al. 2012, Gullick and Scott 2011, Meune et al. 2009, Meune et al. 2010). The excess CV risk (CVR) appears to be caused by both the inflammatory process and an increased prevalence of some of the traditional risk factors for development of CV disease (del Rincon et al. 2001, Innala et al. 2011, Solomon et al. 2010).

In 2010 the European League Against Rheumatism (EULAR) published recommendations for CVR management (Peters et al. 2010), which advocated screening and CVR assessment in all patients with RA according to local guidelines or with the systematic coronary risk evaluation (SCORE) system. SCORE is a multiple traditional risk factor assessment equation based on gender, smoking, age, systolic blood pressure and total-/High Density Lipoprotein (HDL) cholesterol ratio (Peters et al. 2010, Conroy et al. 2003). In order to adjust for the extra risk in patients with RA, this SCORE should be adapted by a multiplication factor of 1.5 if the patient meets two of the following three criteria: a) disease duration  $\geq 10$  years; b) rheumatoid factor and/or anticyclic citrullinated peptide (anti-CCP) positivity; and c) the presence of certain extra-articular manifestations, thereby creating the modified mSCORE (Crowson et al. 2012, Peters et al. 2010). A focus on controlling the patients' disease activity is also very important in order to lower the patient's risk for CV disease (Peters et al. 2010). When the EULAR guidelines for CVR management were published in 2010 (Peters et al. 2010), there was limited evidence for patients with Ankylosing Spondylitis (AS) and Psoriatic Arthritis (PsA). Later studies have supplemented the evidence for an increased risk for them as well, although the evidence that inflammation affects the risk for ischemic heart disease is less conclusive than in RA (Ernste et al. 2015, Jamnitski et al. 2011, Papagoras et al. 2013, Khraishi et al. 2014, Mathieu et al. 2014, Parisi et al. 2015, Wright et al. 2014, Essers et al. 2014)

CVR assessment and management in people with different types of medical conditions involve different health professionals, but across the world nurses in different settings are increasingly undertaking this task (Olde et al. 2013, Rice et al. 2013, Nieuwkerk et al. 2012, Boase et al. 2012, Deaton et al. 2011, Berra 2011, Osborn et al. 2010, Morris et al. 2009, Fair et al. 2009, Jansink et al. 2009, Hoebeke 2008).

EULAR recommendations for the role of the nurse in the management of chronic inflammatory arthritis (IA) (van Eijk-Hustings et al. 2012) encourage nurses to carry out interventions and monitoring as part of comprehensive disease management in these patients. These recommendations also identified the need to define the contribution of the nurse in the prevention of comorbidities in patients with IA (van Eijk-Hustings et al. 2012).

The aim of this paper was to explore nurses' role in assessing and managing CVR in Europe, in order to suggest topics for practice development and research in this area regarding persons with IA.

## **METHODS**

We conducted a systematic literature review and provided practical examples of CVR assessment and management in patients with IA in five European countries. The questions that guided the literature search were (i) how do nurses assess CVR in Europe? and (ii) how do nurses manage CVR in Europe? The literature review is followed by case studies from five different countries to illustrate national guidelines and nurses' role regarding CVR assessment and management in patients with IA.

### **Literature review**

#### **Literature search**

We searched five electronic databases supplemented by a hand search in the reference lists of the included articles. In Embase, CINAHL, Cochrane and PsycInfo we used the search terms: "nurs\*" AND "cardiovascular risk" and in PubMed MEDLINE we used "cardiovascular risk" AND the MeSH term for "nursing". The searches were limited to full text, and to the past 10 years in order to represent recent practice. The inclusion criteria were: (i) studies from Europe, (ii) published from June 2004 through June 2014, (iii) studies reporting descriptions of nurse-led assessment and or management of CVR. Studies were excluded if they only described a protocol, involved children or adolescents or were written in languages other than English, Portuguese, Spanish, Italian, French, Swedish, Norwegian or Danish. Duplicates were discarded. In March 2015 the searches were updated in order to identify relevant articles published from June 2014 through February 2015.

### **Study selection**

Two reviewers (RF and JP) independently screened the titles and abstracts according to the selection criteria. In the screening process, disagreements were discussed until consensus was reached. The articles selected for full text screening were divided between five reviewers (JP, RF, SG, MN and YvE). Each reviewer screened the full texts independently and made a judgement for inclusion/exclusion and documented their reasons based on the predefined inclusion/exclusion criteria. Where the reviewer had doubts, the article was assessed by a second reviewer too before inclusion. Finally the list of included articles was discussed among all authors in order to achieve agreement.

### **Data extraction**

Data extraction was performed using a predefined data extraction form which included: authors, journal, title, publishing date, type of study, number of patients included, medical diagnoses or risks, content of the nurse-led risk assessment and, if done, how nurses managed the identified risk factors. Data extraction was performed independently by each reviewer and then two reviewers (RF and YvE) independently checked the accuracy of the data against the included articles. The data from these forms were synthesized descriptively. See Table 1.

## **RESULTS**

Of the 65 eligible articles, 25 satisfied the inclusion criteria and three were added via hand search.

Through the updated search we identified five additional articles, resulting in a total of 33 included articles (Figure 1).

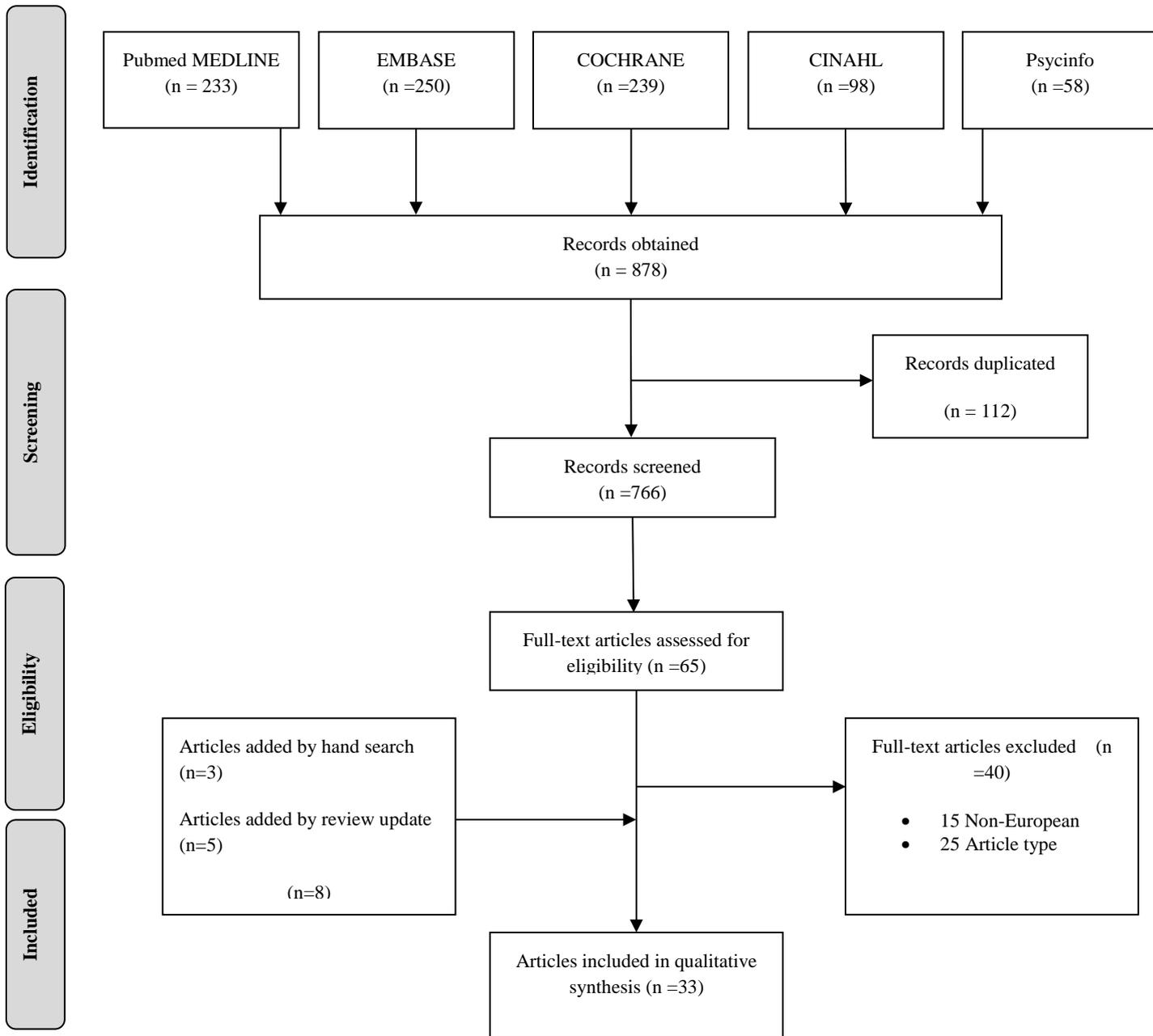


Figure 1: Flowchart of the literature search and inclusion of articles

### **Characteristics of included studies**

The 33 articles represent 30 different studies which are summarised in Table 1. Seventeen of the included articles report results from 14 Randomized Controlled Trials (RCT); eight report cross-sectional studies; three pre-test post-test studies, three discursive articles and two qualitative studies.

### **The settings of nurse-led assessment of CVR**

The included clinical studies showed that European nurses undertake CVR assessment in many different settings such as primary health care (general practice and or in the community) (n=16) or in hospitals (n=15).

### **Type of patients**

Apart from assessment of CVR in the general population (n=3), nurses also undertake risk assessment in patients with one or more already known elevated CVR factors (n=12), known CV diseases (n=5) and in patients with a specific increased risk such as chronic kidney disease (n=4), diabetes (n=2), psychiatric diseases (n=2) or rheumatoid arthritis (n=2).

### **The content of the nurse-led risk assessments**

The included studies describe that nurses usually perform a general risk assessment and check whether treatment goals are achieved (Table 1). The variables included in the nurses' general CVR assessments usually follow recommendations from the national associations for General Practitioners (GPs), hypertension, diabetes or cardiology associations.

The nurses risk assessment includes the measurement of resting blood-pressure (BP) (sitting in a chair and after at least 5 minutes rest) and lipids (all or some of the following: total-, High Density Lipoprotein (HDL)-, Low Density Lipoprotein (LDL)-cholesterol and Triglycerides). In addition, the nurses often assess behavioural risk factors (unhealthy diet, physical inactivity, excess alcohol and smoking), overweight and obesity estimated by Body Mass Index (BMI) and in some cases also waist circumference (Table 1). In three studies the nurses assess both waist and hip circumference (#1, 23 and 28) and calculate a waist/hip ratio. Family history of or known ischemic CV disease and known diabetes or are often included in the nurses' assessment as well as glucose level. In four studies the presence of metabolic

syndrome was assessed (including assessment of abdominal obesity or waist circumference, atherogenic dyslipidaemia, increased BP and insulin resistance) (#6, 16, 28 and 29). Homocysteine level and/or coagulation profile was included in a few studies (#29 and 31). The assessment of stress was described in two of the studies and ankle brachial index in one study (#16). In addition more disease specific measures such as thyroid (#11 and 18), kidney function (#27, 28 and 32), left ventricular hypertrophy (#24) or heart rate (#29) were assessed depending on the type of patients. In this article we will not focus further on these disease specific assessments.

It is also described that nurses assess the patients' motivation for change in risk-related behaviour (#4, 10, 11, 23, 29 and 32), socioeconomic status (#10 and 17) or educational level (#6), and the availability of health services for further support (#4 and 10) (Table 1).

In one study (#17), nurses used additional questionnaires to assess saturated fat, fruit and vegetable intake and physical exercise. In one study the nurses assessed the participants' risk perception and anxiety (#17), and two studies described the assessment of satisfaction or confidence in decisions (#17 and 19).

### **Risk calculation**

Different tools were used to calculate the patients' absolute risk for CV death in 10 years, being the European SCORE system the most used (n=8). See Table 1. Other tools used were the Framingham (n=4) and the modified Framingham (n=1) and the UK Prospective Diabetes Study Risk engine for diabetic patients (n=1).

### **Nurse-led interventions and management of patients' CVR**

Nurses' role in the management of patients' CVR in Europe varied in the identified studies, from brief advice to comprehensive and long-term follow-up. Different roles were described regarding the patients' pharmacological therapy (Table 1) such as creating an overview over the patients' current medication, their preference for medication, adherence or compliance to CVR therapy as well as other types of medication. While in some studies nurses titrated antihypertensive or cholesterol lowering medications (#5, 11, 19 and 25), in others, the results of the nurse assessments were used as a basis for initiation or titration of pharmacological therapy by the rheumatologist or GP (#4 and 8).

The nurses' approach is mainly described as being holistic, individually tailored and based on shared decision making. Nurses aim to empower the patient or increase the patients' self-management abilities or self-efficacy and to take ownership of their risk.

The nurses offer education, additional information materials (in different formats such as leaflets and DVDs), individualized advice and coaching regarding healthy low fat balanced diet, how to lose weight, increase physical activity, reduce alcohol consumption, smoking cessation, adherence to medication and risk perception. Motivational Interviewing is described as a common tool used in discussions regarding life-style (#5, 11, 12, 17 and 20). Nurses also help patients set realistic and achievable goals and how to evaluate them. Some of the included studies describe that the participants were offered additional tools such as a weighing scale and a pedometer (#11), a health booklet (#19) or a sheet with the risk assessment results (#4 and 7). Two of the studies underline that the nurses aimed to involve the patients' partner or family in the education provided (#24 and 26).

One of the major roles for the nurses is referring people with increased risk, due to one or several risk factors, to other available health care resources (Table 1).

### **Education of nurses who perform risk assessment and risk management**

In some of the included studies the nurses, who were undertaking CVR assessment and or management, had received short training in advance. The training included Motivational Interviewing, shared decision-making, risk assessment, risk communication, and the distribution of decision aids (#4, 5, 15, 17 and 20). Video recordings of the nurses' consultations are used in one study in order to provide feedback by medical psychologists (#5).

Table 1: Data extraction form

Author (year) Country	Study type	Number and type of patients	Risk assessment components	Risk scoring	Risk management components
1. Frei, A. et al. (2014) Switzerland	RCT	326 primary care patients with type 2 DM	Waist/hip ratio, BMI, glucose level, BP, total-, HDL- and LDL-cholesterol, smoking, antidiabetic medication	None	<b>How:</b> Self-management support and monitoring <b>What:</b> Clinical parameters (e.g., HbA1c), examinations (e.g., food control), adherence to medications, self-care goals, and other recommendations
2. Korhonen, P. et al. (2014) Finland	Pre-test post-test	2752 primary care patients with at least one CVR factor	A + WC, BMI, glucose level, history (DM, hypertension), medication, family history CVD, alcohol, diabetes risk score (FINDRISC), leisure-time physical activity	SCORE	<b>How:</b> Patient education (verbal and written), referral to physician (within specified criteria) <b>What:</b> Lifestyle advice (diet and physical activity) and explanation of test results
3. Dougados, M. et al. (2014) France	RCT	970 outpatients with RA	B+ BMI, diet, history (CVD, DM, hypertension), family history of CVD, medication	mFramingham	<b>How:</b> Patient education and lifestyle advice, report to GP or R and referral (within specified criteria) <b>What:</b> comorbidity management (eg. importance BP self-measurement by purchasing a BP device)
4. Primdahl, J. et al. (2013) Denmark	Cross-Sectional	836 outpatients with RA	A + WC, BMI, glucose level, physical activity, alcohol, medication, family history (CVD and DM), history (hypertension, DM or CVD)	SCORE and mSCORE	<b>How:</b> Patient education (verbal and written) and training, referral to GP and/or to community health care centres <b>What:</b> Discussing findings with patient, lifestyle advice (eg. smoking, alcohol, physical activity, diet), education regarding RA
5. Jorstad, H. et al. (2013) The Netherlands	RCT	754 patients with acute coronary syndrome	A, B + glucose level, WC, diet, physical activity, medication, stress, CVD history, ethnicity	SCORE and Framingham	<b>How:</b> Patient education (verbal and written), referral to GP or specialist or other HP (within specified criteria), titration of medication (protocolled, Motivational Interviewing) <b>What:</b> Lifestyle advice (eg. diet, smoking, physical exercise and weight/fat distribution), medication adherence)
6. Morales-Asencio, J. et al. (2013) Spain	Cross-sectional	2270 general population	WC, BMI, glucose level, BP, full lipid profile, metabolic syndrome*, CVD, smoking, physical activity, level of education	None	NA

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7. Dedoncker, A. et al. (2012) France	Pre-test post-test	50 patients hospitalized following a coronary artery bypass	BMI, glucose level, BP, full lipid profile, physical activity, diet, smoking, history of CVD	None	<b>How:</b> Patient education (individual consultations) before cardiac rehabilitation discharge, personalized form summarizing tertiary prevention goals  <b>What:</b> Lifestyle factors advice, setting specific goals.
8. Mohammed, M. et al. (2012) UK	RCT (secondary analyses)	500 patients with high CVR (>20% on Framingham) eligible for statin and antihypertensive treatment	B + (family) history CVD, DM, preference for medication, ethnicity	Framingham	<b>How:</b> Referral to GP for prescription of antihypertensive or statin  <b>What:</b> Decision of medication necessity
9. Boase, S. et al. (2012) UK	Qualitative	Two focus-groups (6+6) and 16 interviews with primary care nurses	NA	NA	<b>How:</b> Tailored approach  <b>What:</b> Lifestyle advice (CVR factors)
10. Andric, A. & Vuletic, S.(2012) Croatia	Qualitative	253 patients with increased CVD risk	BMI, BP, DM, diet, physical inactivity, alcohol, smoking, general health, history of CVD	NA	<b>How:</b> Conceptual model for CVR management  <b>What:</b> Behavioural CVR factors
11. Tiessen, A. et al. (2012) The Netherlands	RCT	179 patients without CVD or diabetes but with 10 year CVR > 5% (on SCORE) and at least 1 treatable risk factor	A + BMI, WC, glucose level, physical activity, family history, history of CVD, medication	SCORE	<b>How:</b> Counselling (Motivational Interviewing), feedback based on self-monitoring results (pedometer, weighting scale and/or BP device), treatment/support regarding specific risk factors, follow-up  <b>What:</b> CVR factors (overweight, smoking, physical activity, hypertension and hypercholesterolemia)
12. Van Zuilen, A. et al. (2012) The Netherlands	RCT	788 patients with chronic kidney disease	BMI, glucose level, BP, full lipid profile, smoking, physical activity, history of CVD, DM, medication	None	<b>How:</b> Life-style coaching using Motivational Interviewing, intensive control (added to nephrologist care)  <b>What:</b> CVR factors, adherence to CVD medication
13. Driehuis, F. et al. (2012) The Netherlands	RCT	457 patients with hypertension and/or dyslipidaemia (aged 40 to 70 years, BMI 25 to 40)	BMI, physical activity, diet	None	<b>How:</b> Counselling and feedback consultation  <b>What:</b> Physical activity and dietary intake
14. Van Zuilen, A. et al. (2011) The Netherlands	RCT (interim-analysis of study #12)	692 patients with chronic kidney disease	(please see #12)	None	(please see #12)

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15. Koelewijn-van Loon, M. et al. (2011) The Netherlands	Cross-sectional (nested in a clustered RCT #17 and 22)	421 patients eligible for CVR management	A + BMI, family history of CVD, alcohol, diet, physical activity	SCORE	NA
16. Benítez, C. et al. (2010) Spain	Cross-sectional	73 patients with chronic kidney disease at haemodialysis	BMI, BP, WC, ABPI, CVD, DM, metabolic syndrome*, alcohol, diet, smoking, physical activity, stress	None	NA
17. Koelewijn-van Loon, M. et al. (2010) The Netherlands	RCT	589 patients eligible for CVR management (without CVD)	(please see #15)	SCORE and the UK Prospective Diabetes Study Risk engine for diabetic patients	<b>How:</b> Counselling and Motivational Interviewing, risk communication using a decision tool <b>What:</b> CVR factors, risk perception, confidence and satisfaction using the decision tool
18. Martos-Cerezuela, I. et al. (2010) Spain	Cross-sectional	2270 primary care patients	BMI, WC, BP, glucose level, cholesterol	None	NA
19. Osborn, D. et al. (2010) UK	RCT	6 community mental health teams and 161 outpatients with severe mental illness	B + BMI, glucose level.	Framingham	<b>How:</b> Patient education (verbal and written), contacting and involving primary and secondary services in the screening, referral to other services (smokers), follow-up <b>What:</b> Lifestyle advice (mainly smoking, BP and cholesterol)
20. Voogdt-Pruis, M. et al. (2010) The Netherlands	RCT	701 patients with high risk of CVD (>10% risk on SCORE)	A + BMI	SCORE	<b>How:</b> Counselling (Motivational Interviewing), self-management support and monitoring. <b>What:</b> Lifestyle advice (mainly BP, total- LDL-cholesterol, BMI and smoking).
21. Fusar-Poli, P. et al. (2009) Italy	Cross-sectional	123 outpatients with functional psychosis	BMI, BP, glucose level, alcohol, diet, smoking, physical activity	None	NA
22. Koelewijn-van Loon, M. et al. (2009)	RCT	615 patients eligible for CVR management	please see #15	SCORE	please see #17

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The Netherlands					
23. Pavic, J. et al. (2009) Croatia	Discursive article	NA	Systolic BP, total-/HDL cholesterol ratio, BMI, waist and hip circumference, heart rate, glucose level, smoking, alcohol, diet, physical activity	NA	NA
24. Chamney, M. et al. (2009) UK	Discursive article	NA	Gender, smoking, BP, full lipid profile, DM, left ventricular hypertrophy	NA	NA
25. Tone, J. et al (2009) Ireland	RCT	188 patients with type 2 DM	Weight, BP, glucose level, full lipid profile, smoking, history of CVD, medication	None	<b>How:</b> Patient education (verbal and written) and lifestyle advice, referral to GP, follow-up and feedback about targets, titration of medication (protocolled) <b>What:</b> CVR factors
26. Sol, B. et al. (2008) The Netherlands	RCT (part of Goessens B. et al. 2006 #31)	153 patients with CVD and with at least two modifiable risk factors	BMI, WC, BP, history (CVD, DM), medication, smoking	None	<b>How:</b> Life style advice, self-efficacy promotion, feedback about targets <b>What:</b> CVR factors
27. Iborra-Moltó, C. et al. (2008) Spain	Cross-Sectional	89 patients with chronic kidney disease at haemodialysis, with at least one criteria for metabolic syndrome*	BMI, WC, Triglycerides, HDL-cholesterol, FG, renal function.	None	NA
28. Drevenhorn, E. et al. (2007) Sweden	Pre-test post-test	177 patients with hypertension	Gender, BP, BMI, waist/hip ratio,  renal function, full lipid profile, smoking, alcohol, physical activity, diet, stress, comorbidities, medication, metabolic syndrome*.	None	<b>How:</b> Patient education (verbal and written) and lifestyle advice, follow-up, counselling and feedback consultation and feedback about targets <b>What:</b> CVR factors, effects and side-effects of medications
29. Tonstad, S. et al. (2007) Norway	RCT	51 patients with mild hypertension	B + BMI, WC, heart rate, glucose level, metabolic syndrome*, homocysteine, fibrinogen, diet, physical activity,	Framingham	<b>How:</b> Self-management promotion, life style advice, patients encouraged to contact GP <b>What:</b> CVR factors (metabolic syndrome*, BP, lipid profile and WC)
30. Hill, J. (2007) UK	Discursive	NA	Gender, WC, BMI, BP, lipids, glucose level, smoking, comorbidities	NA	NA, but the recommendation is: <b>How:</b> Life style advice, motivation and support, referral to other health

					professionals <b>What:</b> CVD factors, mainly obesity
31. Goessens, B. et al. (2006) The Netherlands	RCT	175 patients with CVD and with at least 2 modifiable risk factors	BMI, BP, medical history, medication, smoking, alcohol, glucose level, full lipid profile, homocysteine (or see #26)	None	<b>How:</b> Life style advice, self-efficacy and adherence promotion, follow-up and feedback about targets, referral to GP <b>What:</b> CVR factors (or see #26)
32. Mainie, P. et al. (2005) UK	Cross-sectional	563 patients with coronary heart disease, post-MI and/or coronary artery bypass	BMI, BP, full lipid profile, glucose level, CRP, diet (salt intake), alcohol, smoking, physical activity, medical family history, comorbidities, medication, ethnicity	None	<b>How:</b> Life style advice, referrals to other professionals, follow-up and feedback about targets (depending on risk factors and drugs until targets being achieved) <b>What:</b> CVR factors, medication compliance
33. Ellis, G. & Rodger, J. (2005) UK	RCT	205 patients with stroke or TIA and with at least 1 modifiable risk factor	BP, smoking, glucose level, total-cholesterol	None	<b>How:</b> Patient education (verbal and written) and life style advice, patients encouraged to contact GP if unacceptable levels <b>What:</b> CVR factors, medication compliance

**A:** standard risk assessment to calculate the SCORE (age+gender +smoking+systolic BP+ total-/High Density Lipoprotein (HDL) cholesterol ratio); **B:** standard risk assessment to calculate the Framingham score (age+gender+smoking+systolic BP+total Cholesterol+HDL+BP treated with medication); **ABPI:** Ankle Brachial Pressure Index; **BP:** Blood Pressure; **CRP:** C-Reactive Protein; **CVD:** Cardio Vascular Disease; **DM:** Diabetes Mellitus; **Full lipid profile:** Total-, LDL-, HDL-cholesterol and Triglycerides; **Glucose level:** includes fasting glucose or random glucose, glycaemia or HbA1c; **GP:** General practitioner; **HP:** Health Professionals; **R:** Rheumatologist; **RA:** Rheumatoid arthritis; **RCT:** Randomized Controlled Trial; **TIA:** Transient Ischemic Attack; **WC:** Waist circumference; \* Metabolic Syndrome components are (Grundy et al. 2004): abdominal obesity (or WC), atherogenic dyslipidemia, raised BP, insulin resistance ± glucose intolerance, proinflammatory state, prothrombotic state.

### Examples of CV risk assessment and management in patients with IA

The following section provides case studies from five European countries (England, The Netherlands, Denmark, Spain and Portugal), the national guidelines for CVR assessment and management in patients with IA and the nurses' involvement in this task. The examples are based on individual rheumatology centres and are therefore not representative for the respective countries.

#### The UK

In the UK, CVR monitoring has been guided by three guidelines (i) BSR/BHPR guideline for the management of RA in the first 2 years (Luqmani et al. 2006), (ii) BSR/BHPR guidelines for management of RA after the first 2 years (Luqmani et al. 2009), and (iii) NICE guidelines for the management of RA

in adults (NICE 2009). The NICE Guidelines (NICE 2009) recommend the assessment of CVR and comorbidities amongst other things as a part of a comprehensive annual review for people with RA. The recent NICE Quality Standard for RA (Department of Health 2012)(Department of Health 2012) also included the comprehensive annual review. Accordingly, rheumatology services across the UK have implemented annual reviews within nurse-led clinics, but the evidence of the implementation is only starting to emerge especially in nurse-led rheumatology centres (Cornell et al. 2014, Tugnet et al. 2013, Gordon et al. 2015) and in primary care (Monk et al. 2013, Forgie et al. 2015, Hider et al. 2015).

One example of such services is the setup of a nurse-led annual review clinic in Darent Valley Hospital. During the clinic appointment (which lasts for 30 minutes) several assessments are carried out including disease activity, comorbidities including CVR (using QRISK) as well as falls and fracture risks using FRAS and FRAX scores (Palmer and El Miedany 2013, El Miedany et al. 2011). The nurse assesses the patient's functional disability, quality of life, work ability and the possible need for further referral to other health care professionals using the multidimensional Patient Reported Outcome Measures Questionnaire (El Miedany et al. 2010). Patients identified with increased CVR are referred to their GP or for further assessment and management by a specialised team (Palmer and El Miedany 2013). Furthermore, the centre has setup an interactive patient education service ("Managing my heart and arthritis") for patients with IA and CVR which is run by the rheumatology nurse in cooperation with the cardiology nurse specialist.

### **The Netherlands**

In the Netherlands, CVR assessment and management by nurses take place mainly in primary care settings, where practice nurses work closely with GPs, communicating results and supporting them in CVR management. This intervention is guided by The Dutch Standard for General Practitioners (Huisartsgenootschap 2012) which is based on a multidisciplinary guideline created in 2006 and updated in 2011 (Hart and Vaatgroep 2011). Life-style advice concerning weight, smoking and physical activity is included for all patients. Medication (antihypertensive or lipid lowering therapy) is indicated for people with a Framingham score above 10% and certain other risk factors. High disease activity in people with RA is considered a high additional risk.

A position paper regarding CVR management published by The Dutch Society for Rheumatology (Nurmohamed et al. 2007) states that in patients with RA, CVR (e.g. blood pressure, cholesterol levels) should be assessed and registered and appropriate follow up should take place.

At present, CVR assessment and management are not carried out systematically in people with IA. If the patient's CVR is assessed by rheumatology nurses, it is usually only in people with RA and the SCORE tool is used for risk assessment. Patients with an increased CVR are referred to their GP for treatment and follow up.

In Maastricht University Medical Centre, Maastricht, the Netherlands, systematic CVR assessment in patients with gout by rheumatologists and nurses has been initiated. In case of an increased Framingham score (>10%), the patients are referred to their GP for follow-up. The program is planned to embrace patients with RA and Spondyloarthritis (SpA) in the future.

### **Denmark**

The Danish Rheumatologists society incorporated CVR assessment and management in their most recent guideline (Asmussen 2012) based on the EULAR recommendations (Peters et al. 2010), recent guidelines from the Danish Cardiology Association (Hildebrandt et al. 2010) and the Danish Association for General Practice (Christensen et al. 2007). Yearly screening for patients with RA is recommended, but there may be longer intervals depending on the patient's risk. The European SCORE model is recommended for risk assessment using Total/ HDL-cholesterol ratio (Conroy et al. 2003, Asmussen 2012).

At King Christian X's Hospital for Rheumatic Diseases in Graasten, Denmark, nurse-led CVR assessment and management for patients with RA was initiated in September 2011 (Primdahl et al. 2013) based on the national and EULAR recommendations. Later, patients with polyarthritis, PsA and SpA have been included. The nurse has 30 minutes for the consultation including documentation in the patients record and in the national rheumatology database, Danbio (Hetland 2011). Apart from CVR assessment, the patient's motivation, support and barriers in everyday life for changes are part of the dialogue with the patient. Visual charts are used for pedagogical reasons (Kirby and Machen 2009), but the precise calculation of mSCORE or SCORE and BMI are performed electronically in the database. The patients are offered relevant pamphlets and a print with the results from the consultation and they are referred for follow-up by their GP or community health care centres in case of SCORE  $\geq 5\%$  or single risk factors

exceeding defined levels. If the patient's relatives are present they are invited to take part in the consultation as well. The nurses have received education in ischemic CV diseases, the national prevention strategies, how to assess risk based on the SCORE model, diet and options for support in the local community centres. The entire hospital staff has been trained in Motivational Interviewing (Rollnick 2009) which is also used in the consultations.

As Danish GPs are not yet fully aware of the excess risk in patients with IA, risk assessment is still considered to be the rheumatologists' responsibility. In the past couple of years more Danish rheumatology departments and practicing rheumatologists have been implementing similar nurse-led models while others aim to let the rheumatologists include CVR assessment and management in their annual review clinics.

### **Spain**

There are variations in rheumatology units across Spain in terms of nursing experiences in CVR assessment and management, but with very scarce clinical nursing experience regarding this task. The Spanish Rheumatology Society incorporated Recommendations for the management of CVR in patients with RA (Martin-Martinez et al. 2014) . In addition, in agreement with the Rheumatology National Spanish Society (Gobbo 2013), CVR assessment is one of the reasons for rheumatologists to refer a patient to a rheumatology nurse consultation. At present rheumatology nurses in a very few departments follow the EULAR recommendations (Peters et al. 2010), using mainly the mSCORE. In our centre (Moises Broggi Hospital at Sant Joan Despi, Barcelona), during the rheumatology nursing clinical appointment (40 minutes), a CVR assessment is made using the mSCORE (other assessments are also made). If a patient is identified with increased CVR, the rheumatology nurse discusses the case with the rheumatologist and the patient is either referred to their GP for further follow-up or is referred for further assessment and management by a specialized team at the hospital. In addition, patient education addressing changes in lifestyle (diet, exercise and more) are provided by the rheumatology team.

At present, the dissemination and implementation of the new Spanish recommendations for the management of CVR in patients with RA (Martin-Martinez et al. 2014) takes place and a new example was presented at the EULAR conference in 2015 (Martínez Alberola et al. 2015).

## **Portugal**

In Portugal, there is no national recommendation or guideline for CVR assessment and management or monitoring comorbidities in IA patients. CVR assessment and management in rheumatology patients are mainly performed by GPs and primary care nurses, following the general international guidelines (Reiner et al. 2011, Fifth Joint Task Force of the European Society of Cardiology et al. 2012) and the National Health Regulations (Direção-Geral de Saúde 2015, Direção Geral de Saúde 2014). In primary care settings, data to calculate the patients' risk SCORE are requested by computerised clinical records, which are updated by GPs and nurses. The systematisation of this task varies between health care facilities, even within the same township.

CVR assessment and management in IA patients are also performed by rheumatologists, but not in an integrated and systematic procedure. The national rheumatology database registry (<http://www.reuma.pt>) which is used in the clinic by the majority of rheumatologists, includes all the risk factors needed for calculating the SCORE or mSCORE. However in the registry, these factors are not aggregated together to ease the calculation of any risk score. In the registry, the only aggregated value that generates a 'red flag' is an abnormal BMI.

When rheumatologists identify a recurrent elevated risk factor at the rheumatology department at Centro Hospitalar e Universitário de Coimbra, (e.g. hypertension) they may initiate medication, provide brief lifestyle advice or refer the patient for follow-up by a cardiologist or GPs. To the best of our knowledge, nurses are not yet involved in CVR assessment or management in people with IA in Portugal.

## **DISCUSSION**

Our review shows that European nurses undertake CVR assessment and management in many different types of patients and in both hospitals and primary health care settings. Overall the CVR assessments include history taking (family history, smoking, alcohol, diet and physical activity) and measurements (BMI, waist circumference, BP, blood lipids and glucose level). The evidence regarding the use of waist circumference or waist-hip ratio to predict CVR instead of BMI is not clear, but all three measures are highly associated to CV disease (Perk et al. 2013) and waist circumference may be useful to illustrate an abdominal weight problem to the patient. The WHO thresholds for waist circumference in European populations are based on Caucasians and are widely used (Perk et al. 2013), but they should be adjusted

according to ethnic group (Hill 2007, Tillin et al. 2014). SCORE and Framingham were the most used tools to calculate the patients' CVR, but other tools were also used.

Despite the fact that patients with RA have an increased risk similar to that in diabetes (van Halm et al. 2009, Peters et al. 2009), both our review, the country-specific descriptions and other studies indicate that the implementation of CVR assessment and management in patients with IA is still scarce irrespective of whether this role is undertaken by rheumatologists, GPs or nurses (Peters and Nurmohamed 2013, Monk et al. 2013, Garcia-Diaz and Corominas 2013). Only two of the included studies described nurse-led CVR assessment and management in rheumatology (Primdahl et al. 2013, Dougados et al. 2014).

As indicated by the country specific descriptions there are unsolved decisions regarding who should perform CVR assessment and management and how this should be organized and this is supported in the literature (Dessein and Semb 2013, van den Oever et al. 2013). Furthermore the rheumatologists may find it difficult to allocate time for CVR assessment and they may not feel that CVR management is part of their core tasks. These issues may explain part of the inertia to implement systematic screening in patients with IA. A French multicentre RCT reported the first results from comprehensive nurse-led screening of comorbidities including CV disease in patients with RA with a positive impact on several CVR outcomes (Dougados et al. 2014), but more evidence is needed regarding the effectiveness of CVR screening and management.

It is important to acknowledge that pharmacological treatment to control the inflammation is a very important part of the efforts needed to achieve a reduced CVR (van den Oever et al. 2013, Choy et al. 2014). This is an important task for the rheumatologist or nurses where they undertake extended roles. The initiation and titration of antihypertensive and lipid lowering therapy in patients with increased CVR can be managed in cooperation between the rheumatology nurse and the rheumatologist or by referral to the patient's GP. Also, nurses are described to have an important role in discussing current medication and adherence issues with the patient.

An unsupportive social environment can have a strong negative influence on the individual's health related behaviour and socially deprived persons may be less capable of becoming actively engaged in their own health (Andric and Vuletic 2012). The nurse should avoid focusing only on the individual

choice and responsibility as CVR depends on socio-economic status as well, in terms of educational level and income, job and living conditions in a broader sense (Perk et al. 2013, Vallgarda 2011).

In order to avoid a 'tick the box' culture or becoming just 'risk police' (Boase et al. 2012), nurses need to engage with the individual patient and help support the patient's risk perception and make CVR meaningful to patients. This requires that nurses explore the patient's social context, emotions, preferences and motivation, regarding life-style modifications and the barriers and possibilities for changes. Furthermore the nurse should try to empower the patient, individualise the education and respect the patient's own choices as described in some of the included studies (Boase et al. 2012, Andric and Vuletic 2012, Pavic et al. 2009, Chamney et al. 2009, Sol et al. 2008).

Appropriate training has been shown to affect the counselling to become patient-centred and focused (Drevenhorn et al. 2009). Training of the nurses who perform CVR assessment and management should include how to assess the different risk factors in order to achieve reliable measures, how to calculate a risk score, risk management including a patient centred approach and theoretical health pedagogy for risk communication and how to motivate and support the patient to achieve the goals they would like to pursue. While initial training is important, other measures (such as further training) should be put in place in order to prevent errors. A Dutch study reported that despite 75 minutes training, nurses made small but important errors in risk calculation of high risk patients; errors that could lead to missed opportunities for risk-reducing interventions (Koelewijn-van Loon et al. 2011). In the Danish study, the risk calculation (SCORE) was performed electronically (Primdahl et al. 2013) and thus manual mistakes could be prevented although emphasis would then need to be put on preventing entry errors.

### **Strengths and limitations of the study**

This was a limited systematic literature review; therefore there will probably be relevant studies that have not been included. Also there may be additional content of the nurses risk assessment and management which was not described in the included studies. The aim of our literature search was to explore nurses' role in assessing and managing CVR in Europe, in order to suggest topics for practice development and research in this area regarding persons with IA. We excluded non-European articles, which could be seen as another limitation, but knowing that the nurses' education, skills and how health care is organized across Europe varies, we did not want to add further differences. Since we were interested in the

descriptions of risk assessment and management, rather than effectiveness of interventions, we did not perform a formal assessment of the quality or risk of bias of the included studies. Lastly, the examples given in our country case studies may not be generalizable since clinical practice varies from centre to centre within each country. The main strength of this study is having an international collaboration with different perspectives and real examples of nurses' role in CVR assessment and management. The results of this study could form a strong basis for future research.

### **Implications for future research**

Further research is needed to investigate the clinical effectiveness and cost-effectiveness of nurse-led risk assessment and management in reducing patients' risk for development of diabetes and CV disease. Secondly, further research is required to assess how risk can be communicated in a meaningful way to the patient and how often (Waldron et al. 2011). Future research in this area needs to provide accurate descriptions of (i) how the nurses are trained in undertaking CVR assessment and management, (ii) which risk factors are assessed by the nurses, (iii) how nurses assess the CV risk factors and (iv), how the nurses communicate risk, (v) how nurses manage CV risk and (vi) how nurses and the rheumatologists collaborate with the GPs, practice nurses and other health professionals to optimise CVR assessment and management. Screening for risk of a disease is likely to lead to both positive and negative reactions in the patients. So far only one recent study has explored RA patients' experiences from participation in nurse-led CVR (Frølund and Primdahl 2015). Therefore more qualitative studies of the patients' experiences from participation in different versions of CVR assessment and management and their risk perception in IA are needed. Lastly, the effectiveness of telemedicine and ubiquitous computing (such as smartphone apps) in risk assessment and management for people with IA needs to be explored.

### **CONCLUSION**

European nurses perform assessment of known CVR factors (BP, BMI, waist circumference, glucose and lipid-profile, adherence to medication, unhealthy diet, physical inactivity, excess alcohol use and smoking) and calculate the patient's risk score in different groups of patients.

Risk management differ from brief advice to long-term follow-up. The nurses focus on patient involvement, adherence to medications, preferences, barriers, motivation and resources for life-style

modifications. The nurses refer the patients for further follow up by their rheumatologist, GP or resources in primary care. Antihypertensive, lipid lowering and diabetes medications can be initiated and titrated by the rheumatologist, the GP or nurses with extended roles depending on the national context.

With appropriate training it is considered to be a highly relevant task for rheumatology nursing to perform CVR assessment, to communicate and manage CVR and provide relevant patient education, especially in patients with IA. Further studies are needed to assess the patients' perspective, effectiveness and cost-effectiveness of nurse-led CVR assessment and management in reducing patients' risk for development of diabetes and CV disease.

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## REFERENCES

- Andric, A. & Vuletic, S. (2012) Community nurse assessment of cardiovascular behavioural risk factors-- a qualitative analysis within the CroHort study. *Coll Antropol*, **36 Suppl 1**, 27-34.
- Asmussen, K.H.P., Kristian Steengaard; Hørslev-Petersen, Kim; Schlemmer, Annette; Hansen, Annette; Stoltenberg, Michael; Gam, Arne (2012) Reumatoid Artrit - klinisk retningslinje.
- Avina-Zubieta, J.A., Thomas, J., Sadatsafavi, M., Lehman, A.J. & Lacaille, D. (2012) Risk of incident cardiovascular events in patients with rheumatoid arthritis: a meta-analysis of observational studies. *Ann Rheum Dis*, **71**(9), 1524-9.
- Berra, K. (2011) Does nurse case management improve implementation of guidelines for cardiovascular disease risk reduction? *The Journal of cardiovascular nursing*, **26**(2), 145-167.
- Boase, S., Mason, D., Sutton, S. & Cohn, S. (2012) Tinkering and tailoring individual consultations: how practice nurses try to make cardiovascular risk communication meaningful. *Journal of Clinical Nursing*, **21**(17/18), 2590-2598.
- Chamney, M., Pugh-Clarke, K. & Kafkia, T. (2009) Management of co-morbid diseases in a patient with established renal failure. *J Ren Care*, **35**(3), 151-8.
- Choy, E., Ganeshalingam, K., Semb, A.G., Szekanecz, Z. & Nurmohamed, M. (2014) Cardiovascular risk in rheumatoid arthritis: recent advances in the understanding of the pivotal role of inflammation, risk predictors and the impact of treatment. *Rheumatology (Oxford)*, **53**(12), 2143-2154.
- Christensen, B., Færgemann, O., Heebøll-Nielsen, N.C., Lous, J., Madsen, L.D. & Stender, S. (2007) Forebyggelse af iskæmisk hjerte-kar-sygdom i almen praksis (DSAM, D. S. f. A. M. D. a. f. g. p. ed., pp. 52.
- Conroy, R.M., Pyorala, K., Fitzgerald, A.P., Sans, S., Menotti, A., De Backer, G., De Bacquer, D., Ducimetiere, P., Jousilahti, P., Keil, U., Njolstad, I., Oganov, R.G., Thomsen, T., Tunstall-Pedoe, H., Tverdal, A., Wedel, H., Whincup, P., Wilhelmsen, L. & Graham, I.M. (2003) Estimation of ten-year risk of fatal cardiovascular disease in Europe: the SCORE project. *Eur Heart J*, **24**(11), 987-1003.
- Cornell, P., Wright, S., Christopher, J. & Thompson, P. (2014) Annual review for inflammatory arthritis patients: A NICE extra but a challenge to implement [abstract]. *Rheumatology*, **53**(suppl 1), i114-i115.
- Crowson, C.S., Matteson, E.L., Roger, V.L., Thorneau, T.M. & Gabriel, S.E. (2012) Usefulness of risk scores to estimate the risk of cardiovascular disease in patients with rheumatoid arthritis. *Am J Cardiol*, **110**(3), 420-4.
- Deaton, C., Froelicher, E.S., Wu, L.H., Ho, C., Shishani, K. & Jaarsma, T. (2011) The global burden of cardiovascular disease. *J Cardiovasc Nurs*, **26**(4 Suppl), S5-14.
- del Rincon, I.D., Williams, K., Stern, M.P., Freeman, G.L. & Escalante, A. (2001) High incidence of cardiovascular events in a rheumatoid arthritis cohort not explained by traditional cardiac risk factors. *Arthritis Rheum*, **44**(12), 2737-45.

Department of Health (2012) NICE quality standards (QS33): Quality standards for rheumatoid arthritis. . (Health, D. o. ed. Crown, London.

Dessein, P.H. & Semb, A.G. (2013) Could cardiovascular disease risk stratification and management in rheumatoid arthritis be enhanced? *Ann Rheum Dis*, **72**(11), 1743-6.

Direção-Geral de Saúde (2015) Avaliação do Risco Cardiovascular SCORE (Systematic Coronary Risk Evaluation). *Norma 005/2013*, 1-16.

Direção Geral de Saúde (2014) Processo Assistencial Integrado do Risco Cardiovascular no Adulto. *Norma 009/2014*.

Dougados, M., Soubrier, M., Perrodeau, E., Gossec, L., Fayet, F., Gilson, M., Cerato, M.H., Pouplin, S., Flipo, R.M., Chabrefy, L., Mouterde, G., Euller-Ziegler, L., Schaeverbeke, T., Fautrel, B., Saraux, A., Chary-Valckenaere, I., Chales, G., Dernis, E., Richette, P., Mariette, X., Berenbaum, F., Sibilia, J. & Ravaut, P. (2014) Impact of a nurse-led programme on comorbidity management and impact of a patient self-assessment of disease activity on the management of rheumatoid arthritis: results of a prospective, multicentre, randomised, controlled trial (COMEDRA). *Ann Rheum Dis*.

Drevenhorn, E., Bengtson, A. & Kjellgren, K.I. (2009) Evaluation of consultation training in hypertension care. *European Journal of Cardiovascular Nursing*, **8**(5), 349-354.

El Miedany, Y., El Gaafary, M., Toth, M., Palmer, D. & Ahmed, I. (2011) Falls risk assessment score (FRAS): Time to rethink. *Journal of Clinical Gerontology and Geriatrics*, **2**(1), 21-26.

El Miedany, Y., El Gaafary, M., Youssef, S.S. & Palmer, D. (2010) Incorporating patient reported outcome measures in clinical practice: development and validation of a questionnaire for inflammatory arthritis. *Clin Exp Rheumatol*, **28**(5), 734-44.

Ernste, F.C., Sanchez-Menendez, M., Wilton, K.M., Crowson, C.S., Matteson, E.L. & Maradit Kremers, H. (2015) Cardiovascular Risk Profile at the Onset of Psoriatic Arthritis: A Population-based, Cohort Study. *Arthritis Care Res (Hoboken)*.

Essers, I., Stolwijk, C., Boonen, A., De Bruin, M.L., Bazelier, M.T., de Vries, F. & van Tubergen, A. (2014) Ankylosing spondylitis and risk of ischaemic heart disease: a population-based cohort study. *Ann Rheum Dis*.

Fair, J.M., Gulanick, M. & Braun, L.T. (2009) Cardiovascular risk factors and lifestyle habits among preventive cardiovascular nurses. *Journal of Cardiovascular Nursing*, **24**(4), 277-286.

Fifth Joint Task Force of the European Society of Cardiology, European Association of Echocardiography, European Association of Percutaneous Cardiovascular Interventions, European Heart Rhythm Association, Heart Failure Association, European Association for Cardiovascular Prevention, Rehabilitation, European Atherosclerosis, S., International Society of Behavioural, M., European Stroke, O., European Society of, H., European Association for the Study of, D., European Society of General Practice/Family, M., International Diabetes Federation, E. & European Heart, N. (2012) European Guidelines on cardiovascular disease prevention in clinical practice (version 2012): the Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). *Eur J Prev Cardiol*, **19**(4), 585-667.

- Forgie, B., Earl, A., Makadsi, R., Griffith, S. & Garrood, T. (2015) 121. Rheumatoid Arthritis Annual Review in Primary Care. *Rheumatology*, **54**(suppl 1), i98.
- Frølund, J.C. & Primdahl, J. (2015) Patients' Experiences of Nurse-led screening for Cardiovascular Risk in Rheumatoid Arthritis. *Musculoskeletal Care*, **12**.
- Garcia-Diaz, S. & Corominas, H. (2013) Nurse management of cardiovascular risk factors in rheumatoid arthritis. *Br J Nurs*, **22**(14), 813-7.
- Gobbo, M.d.I.T., J; Cano, L; Martinez, N; et al (2013) Criterios de derivación desde reumatología a enfermería. *Reu Clin*, **Supp Espec. Cong**.
- Gordon, F., Wijeyekoon, J., Ellis, S. & Marianayagam, T. (2015) BHPR Clinical Prize 122. Nurse-led Annual Review Service for Stable Inflammatory Arthritis. *Rheumatology*, **54**(suppl 1), i98-i99.
- Grundy, S.M., Brewer, H.B., Jr., Cleeman, J.I., Smith, S.C., Jr. & Lenfant, C. (2004) Definition of metabolic syndrome: Report of the National Heart, Lung, and Blood Institute/American Heart Association conference on scientific issues related to definition. *Circulation*, **109**(3), 433-8.
- Gullick, N.J. & Scott, D.L. (2011) Co-morbidities in established rheumatoid arthritis. *Best Pract Res Clin Rheumatol*, **25**(4), 469-83.
- Hart & Vaatgroep (2011) Multidisciplinaire richtlijn Cardiovasculair Risicomanagement (Guideline for multidisciplinary cardiovascular risk management).
- Hetland, M.L. (2011) DANBIO--powerful research database and electronic patient record. *Rheumatology (Oxford)*, **50**(1), 69-77.
- Hider, S., Blagojevic-Bucknall, M., Case, R., Clarkson, K., Stack, R., Raza, K. & Mallen, C.D. (2015) 045. What Does a Primary Care Annual Review for Rheumatoid Arthritis Include? A National General Practitioner Survey. *Rheumatology*, **54**(suppl 1), i66.
- Hildebrandt, P., Larsen, M.L., Prescott, E., Rasmussen, H. & Thomsen, K.K. (2010) Forebyggelse af hjertesygdom (Association, D. C. ed. <http://www.cardio.dk>).
- Hill, J. (2007) Identifying people with abdominal obesity and their current treatment options. *Journal of Diabetes Nursing*, **11**(8), 295.
- Hoebek, R.E. (2008) Cardiovascular disease prevention in women: the role of the nurse practitioner in primary care. *Crit Care Nurs Clin North Am*, **20**(3), 297-304.
- Huisartsgenootschap, N. (2012) Standard cardiovasculair risicomanagement (eerste herziening). *Huisarts Wet*, **55**(1), 14-28.
- Innala, L., Moller, B., Ljung, L., Magnusson, S., Smedby, T., Sodergren, A., Ohman, M.L., Rantapaa-Dahlqvist, S. & Wallberg-Jonsson, S. (2011) Cardiovascular events in early RA are a result of inflammatory burden and traditional risk factors: a five year prospective study. *Arthritis Res Ther*, **13**(4), R131.

- Jamnitski, A., Visman, I.M., Peters, M.J., Boers, M., Dijkmans, B.A. & Nurmohamed, M.T. (2011) Prevalence of cardiovascular diseases in psoriatic arthritis resembles that of rheumatoid arthritis. *Ann Rheum Dis*, **70**(5), 875-6.
- Jansink, R., Braspenning, J., van der Weijden, T., Niessen, L., Elwyn, G. & Grol, R. (2009) Nurse-led motivational interviewing to change the lifestyle of patients with type 2 diabetes (MILD-project): protocol for a cluster, randomized, controlled trial on implementing lifestyle recommendations. *BMC Health Serv Res*, **9**, 19.
- Khraishi, M., Aslanov, R., Rampakakis, E., Pollock, C. & Sampalis, J.S. (2014) Prevalence of cardiovascular risk factors in patients with psoriatic arthritis. *Clin Rheumatol*, **33**(10), 1495-500.
- Kirby, M. & Machen, I. (2009) Impact on clinical practice of the Joint British Societies' cardiovascular risk assessment tools. *International Journal of Clinical Practice*, **63**(12), 1683-1692.
- Koelewijn-van Loon, M.S., Eurlings, J.W.G., Winkens, B., Elwyn, G., Grol, R., Steenkiste, B. & Weijden, T. (2011) Small but important errors in cardiovascular risk calculation by practice nurses: A cross-sectional study in randomised trial setting. In *International Journal of Nursing Studies*, Vol. 48, pp. 285-291.
- Luqmani, R., Hennell, S., Estrach, C., Basher, D., Birrell, F., Bosworth, A., Burke, F., Callaghan, C., Candal-Couto, J., Fokke, C., Goodson, N., Homer, D., Jackman, J., Jeffreson, P., Oliver, S., Reed, M., Sanz, L., Stableford, Z., Taylor, P., Todd, N., Warburton, L., Washbrook, C. & Wilkinson, M. (2009) British Society for Rheumatology and British Health Professionals in Rheumatology guideline for the management of rheumatoid arthritis (after the first 2 years). *Rheumatology*, **48**(4), 436-439.
- Luqmani, R., Hennell, S., Estrach, C., Birrell, F., Bosworth, A., Davenport, G., Fokke, C., Goodson, N., Jeffreson, P., Lamb, E., Mohammed, R., Oliver, S., Stableford, Z., Walsh, D., Washbrook, C., Webb, F., Rheumatology, o.b.o.t.B.S.f., British Health Professionals in Rheumatology Standards, G. & Group, A.W. (2006) British Society for Rheumatology and British Health Professionals in Rheumatology Guideline for the Management of Rheumatoid Arthritis (the first two years). *Rheumatology*, **45**(9), 1167-1169.
- Martin-Martinez, M.A., Gonzalez-Juanatey, C., Castaneda, S., Llorca, J., Ferraz-Amaro, I., Fernandez-Gutierrez, B., Diaz-Gonzalez, F. & Gonzalez-Gay, M.A. (2014) Recommendations for the management of cardiovascular risk in patients with rheumatoid arthritis: scientific evidence and expert opinion. *Semin Arthritis Rheum*, **44**(1), 1-8.
- Martínez Alberola, N., Sivera, F., Andres, M., Fernández-Carballido, C., Martín-Domenech, R., Martínez-Vidal, M.P. & San Martín-Alvarez, A. (2015) OP0140-HPR The Role of a Nurse-Clinic in the Assessment and Prevention of Cardio-Vascular Risk. In *EULAR*, Vol. 74 Ann Rheum Dis, Rome, pp. 121.
- Mathieu, S., Pereira, B. & Soubrier, M. (2014) Cardiovascular events in ankylosing spondylitis: An updated meta-analysis. *Semin Arthritis Rheum*.
- Meune, C., Touze, E., Trinquart, L. & Allanore, Y. (2009) Trends in cardiovascular mortality in patients with rheumatoid arthritis over 50 years: a systematic review and meta-analysis of cohort studies. *Rheumatology (Oxford)*, **48**(10), 1309-13.

- Meune, C., Touze, E., Trinquart, L. & Allanore, Y. (2010) High risk of clinical cardiovascular events in rheumatoid arthritis: Levels of associations of myocardial infarction and stroke through a systematic review and meta-analysis. *Arch Cardiovasc Dis*, **103**(4), 253-61.
- Monk, H.L., Muller, S., Mallen, C.D. & Hider, S.L. (2013) Cardiovascular screening in rheumatoid arthritis: a cross-sectional primary care database study. *BMC Family Practice*, **14**(1), 150.
- Morris, D., McLean, D., Costello, J.A. & Cloutier, L. (2009) Recognition and management of hypertension by nurses: action in patients with diabetes is critical. *Can J Cardiovasc Nurs*, **19**(4), 4-12.
- NICE (2009) Rheumatoid arthritis: The management of rheumatoid arthritis in adults. In *NICE Guideline 79*, Vol. 2014 Royal College of Physicians, London.
- Nieuwkerk, P.T., Nierman, M.C., Vissers, M.N., Locadia, M., Greggers-Peusch, P., Knape, L.P., Kastelein, J.J., Sprangers, M.A., de Haes, H.C. & Stroes, E.S. (2012) Intervention to improve adherence to lipid-lowering medication and lipid-levels in patients with an increased cardiovascular risk. *Am J Cardiol*, **110**(5), 666-72.
- Nurmohamed, M., Smulders, Y., Voskuyl, A., Lems, W. & Dijkmans, B. (2007) Amsterdamse Richtlijn: Cardiovasculair Risicomanagement bij Reumatoïde Artritis (Amsterdam guideline: Cardiovascular Risk management in Rheumatoid Arthritis).
- Olde, D., Alpert, P. & Dalusung-Angosta, A. (2013) Metabolic syndrome: clinical perspective for best practice. *J Am Assoc Nurse Pract*, **25**(12), 644-52.
- Osborn, D.P., Nazareth, I., Wright, C.A. & King, M.B. (2010) Impact of a nurse-led intervention to improve screening for cardiovascular risk factors in people with severe mental illnesses. Phase-two cluster randomised feasibility trial of community mental health teams. *BMC Health Serv Res*, **10**, 61.
- Palmer, D. & El Miedany, Y. (2013) From guidelines to clinical practice: cardiovascular risk management in inflammatory arthritis patients. *Br J Community Nurs*, **18**(9), 424-8.
- Papagoras, C., Voulgari, P.V. & Drosos, A.A. (2013) Atherosclerosis and cardiovascular disease in the spondyloarthritis, particularly ankylosing spondylitis and psoriatic arthritis. *Clin Exp Rheumatol*, **31**(4), 612-20.
- Parisi, R., Rutter, M.K., Lunt, M., Young, H.S., Symmons, D.P., Griffiths, C.E. & Ashcroft, D.M. (2015) Psoriasis and the Risk of Major Cardiovascular Events: Cohort Study Using the Clinical Practice Research Datalink. *J Invest Dermatol*.
- Pavic, J., Zupanic, M., Milanovic, S.M. & Fister, K. (2009) Primary and secondary prevention of cardiovascular diseases embedded in the visiting nurse services: description of the intervention model. *Coll Antropol*, **33 Suppl 1**, 81-6.
- Perk, J., De Backer, G., Gohlke, H., Graham, I., Reiner, Z., Verschuren, W.M., Albus, C., Benlian, P., Boysen, G., Cifkova, R., Deaton, C., Ebrahim, S., Fisher, M., Germano, G., Hobbs, R., Hoes, A., Karadeniz, S., Mezzani, A., Prescott, E., Ryden, L., Scherer, M., Syvanne, M., Scholte Op Reimer, W.J., Vrints, C., Wood, D., Zamorano, J.L. & Zannad, F. (2013) [European Guidelines on Cardiovascular Disease Prevention in Clinical Practice (version 2012). The Fifth Joint Task

- Force of the European Society of Cardiology and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of nine societies and by invited experts)]. *G Ital Cardiol (Rome)*, **14**(5), 328-92.
- Peters, M.J. & Nurmohamed, M.T. (2013) Cardiovascular risk management in rheumatoid arthritis: are we still waiting for the first step? *Arthritis Res Ther*, **15**(2), 111.
- Peters, M.J., Symmons, D.P., McCarey, D., Dijkmans, B.A., Nicola, P., Kvien, T.K., McInnes, I.B., Haentzschel, H., Gonzalez-Gay, M.A., Provan, S., Semb, A., Sidiropoulos, P., Kitas, G., Smulders, Y.M., Soubrier, M., Szekanecz, Z., Sattar, N. & Nurmohamed, M.T. (2010) EULAR evidence-based recommendations for cardiovascular risk management in patients with rheumatoid arthritis and other forms of inflammatory arthritis. *Ann Rheum Dis*, **69**(2), 325-31.
- Peters, M.J., van Halm, V.P., Voskuyl, A.E., Smulders, Y.M., Boers, M., Lems, W.F., Visser, M., Stehouwer, C.D., Dekker, J.M., Nijpels, G., Heine, R., Dijkmans, B.A. & Nurmohamed, M.T. (2009) Does rheumatoid arthritis equal diabetes mellitus as an independent risk factor for cardiovascular disease? A prospective study. *Arthritis Rheum*, **61**(11), 1571-9.
- Primdahl, J., Clausen, J. & Horslev-Petersen, K. (2013) Results from systematic screening for cardiovascular risk in outpatients with rheumatoid arthritis in accordance with the EULAR recommendations. *Ann Rheum Dis*, **72**(11), 1771-6.
- Reiner, Z., Catapano, A.L., De Backer, G., Graham, I., Taskinen, M.R., Wiklund, O., Agewall, S., Alegria, E., Chapman, M.J., Durrington, P., Erdine, S., Halcox, J., Hobbs, R., Kjekshus, J., Filardi, P.P., Riccardi, G., Storey, R.F. & Wood, D. (2011) ESC/EAS Guidelines for the management of dyslipidaemias: the Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS). *Eur Heart J*, **32**(14), 1769-818.
- Rice, V.H., Hartmann-Boyce, J. & Stead, L.F. (2013) Nursing interventions for smoking cessation. *Cochrane Database Syst Rev*, **8**, CD001188.
- Rollnick, S.M., William R. & Butler, Christopher C. (2009) *Motivationsamtqlen i sundhedssektoren (Motivational Interviewing in Health Care - Helping Patients Change Behaviour)*, Gyldendals bogklubber, Gylling.
- Sol, B.G., van der Graaf, Y., van der Bijl, J.J., Goessens, B.M. & Visseren, F.L. (2008) The role of self-efficacy in vascular risk factor management: a randomized controlled trial. *Patient Educ Couns*, **71**(2), 191-7.
- Solomon, D.H., Kremer, J., Curtis, J.R., Hochberg, M.C., Reed, G., Tsao, P., Farkouh, M.E., Setoguchi, S. & Greenberg, J.D. (2010) Explaining the cardiovascular risk associated with rheumatoid arthritis: traditional risk factors versus markers of rheumatoid arthritis severity. *Ann Rheum Dis*, **69**(11), 1920-5.
- Tillin, T., Sattar, N., Godsiland, I.F., Hughes, A.D., Chaturvedi, N. & Forouhi, N.G. (2014) Ethnicity-specific obesity cut-points in the development of Type 2 diabetes - a prospective study including three ethnic groups in the United Kingdom. *Diabet Med*.
- Tugnet, N., Pearce, F., Tosounidou, S., Obrenovic, K., Erb, N., Packham, J. & Sandhu, R. (2013) To what extent is NICE guidance on the management of rheumatoid arthritis in adults being implemented in clinical practice? A regional survey. *Clinical Medicine*, **13**(1), 42-46.

- Vallgarda, S. (2011) Why the concept "lifestyle diseases" should be avoided. *Scand J Public Health*, **39**(7), 773-5.
- van den Oever, I.A., van Sijl, A.M. & Nurmohamed, M.T. (2013) Management of cardiovascular risk in patients with rheumatoid arthritis: evidence and expert opinion. *Ther Adv Musculoskelet Dis*, **5**(4), 166-81.
- van Eijk-Hustings, Y., van Tubergen, A., Bostrom, C., Braychenko, E., Buss, B., Felix, J., Firth, J., Hammond, A., Harston, B., Hernandez, C., Huzjak, M., Korandova, J., Kukkurainen, M.L., Landewe, R., Mezieres, M., Milincovic, M., Moretti, A., Oliver, S., Primdahl, J., Scholte-Voshaar, M., de la Torre-Aboki, J., Waite-Jones, J., Westhovens, R., Zangi, H.A., Heiberg, T., Hill, J. & Eular (2012) EULAR recommendations for the role of the nurse in the management of chronic inflammatory arthritis. *Annals of the Rheumatic Diseases*, **71**(1), 13-9.
- van Halm, V.P., Peters, M.J., Voskuyl, A.E., Boers, M., Lems, W.F., Visser, M., Stehouwer, C.D., Spijkerman, A.M., Dekker, J.M., Nijpels, G., Heine, R.J., Bouter, L.M., Smulders, Y.M., Dijkmans, B.A. & Nurmohamed, M.T. (2009) Rheumatoid arthritis versus diabetes as a risk factor for cardiovascular disease: a cross-sectional study, the CARRE Investigation. *Ann Rheum Dis*, **68**(9), 1395-400.
- Waldron, C.A., van der Weijden, T., Ludt, S., Gallacher, J. & Elwyn, G. (2011) What are effective strategies to communicate cardiovascular risk information to patients? A systematic review. *Patient Educ Couns*, **82**(2), 169-81.
- Wright, K.A., Crowson, C.S., Michet, C.J. & Matteson, E.L. (2014) Time trends in incidence, clinical features and cardiovascular disease in Ankylosing Spondylitis over 3 decades: A population based study. *Arthritis Care Res (Hoboken)*.