

Statistical analysis plan (SAP) for:

**Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)**

**Project:** BACK pain in Elders in Norway (BACE-N) (BACE-N)

**NCT number:** NCT04261309

**Document date:** 11.03.2021

## 1. Introduction to SAP

### 1.1 Scope

This document is a supplement to the BACE-N protocol (ClinicalTrials.gov Identifier: NCT04261309) and comprises a SAP for the article “Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and external validation study”. The current SAP has been written while data collection was ongoing (we had access to baseline data, but not to follow-up data) and it will be uploaded to the ClinicalTrials.gov before full access to the study database.

## 2. Administrative information

### Version of SAP

1.0

### Study sponsor

Oslo Metropolitan University, the Norwegian Fund for Post-Graduate Training in Physiotherapy and “Et liv i bevegelse” (A life in movement) - Norwegian chiropractors’ research foundation

### Names, affiliations and roles of SAP contributors

Name	Title	Affiliation	Role
Margreth Grotle	Professor	Oslo Metropolitan University P44, 0167 Oslo Phone: 90111172 Email: mgrotle@oslomet.no	Principal Investigator
Rikke Munk Killingmo	PhD-student	Oslo Metropolitan University	Main author of SAP
Kjersti Storheim	Professor	Oslo Metropolitan University	Contributor to SAP
Daniëlle van der Windt	Professor	Keele University	Contributor to SAP
Bart Koes	Professor	Erasmus MC	Contributor to SAP
Sita Bierma-Zienstra	Professor	Erasmus MC	Contributor to SAP
Alessandro Chiarotto	Post-doc, PhD	Erasmus MC	Contributor to SAP
Milada C. Småstuen	Professor	Oslo Metropolitan University	Statistical advisor
Ørjan Nesse Vigdal	PhD-student	Oslo Metropolitan University	Contributor to SAP
Lise Kretz	PhD-student	Oslo Metropolitan University	Contributor to SAP

### Signatures: Person writing SAP, senior statistician and chief investigator

---

**Rikke Munk Killingmo**

Main author of the SAP

---

**Milada Småstuen**

Senior statistician responsible

---

**Margreth Grotle**

Principal Investigator

### 3. Study aim

The aim of this study is 1) to identify modifiable prognostic factors for high costs related to healthcare utilization among older people seeking primary care with a new episode of back pain and 2) to replicate the identified associations of modifiable prognostic factors in a similar cohort of older back pain patients.

### 4. Study design, population and method

#### Study design

This study will be carried out in two steps. First, modifiable prognostic factors will be identified in a prospective observational cohort study with one year of follow-up within a Norwegian primary care setting (the BACE-N). Next, a replication analysis of identified prognostic factors will be conducted in a prospective observational cohort study within a Dutch primary care setting (the BACE-D).

The BACE-N and the BACE-D studies are part of the international BACE consortium [1]. The BACE-N study (ClinicalTrials.gov Identifier: NCT04261309) was classified as a quality assessment study by the Norwegian Regional Committee for medical Research Ethics (reference no. 2014/1634/REK vest) and approved by the Norwegian Social Science Data Service (reference no. 42149) in 2015.

#### Study population and recruitment

**BACE-N:** Eligible patients are people 55 years of age or older who seek primary care (physiotherapist, chiropractor or GP) with a new episode of back pain (preceded by 6 months without visiting a primary care provider for similar complaints). Patients are excluded if they have difficulties completing the questionnaires (e.g. unable to speak, read or write in Norwegian) or if they have difficulties completing the physical examination (e.g. are wheelchair bound). Patients are recruited from physiotherapist, chiropractors and GPs working in Norwegian primary care between April 2015 and February 2020. Patients who meet the eligibility criteria and complete the consent to participate are included in the study.

**BACE-D:** Eligible patients were people over 55 years of age (n=675) who sought primary care (GPs) with a new episode of back pain (preceded by 6 months without visiting a primary care provider for similar complaints). Patients were excluded if they had difficulties completing the questionnaires (e.g. unable to speak, read or write in Dutch) or if they had difficulties completing the physical examination (e.g. are wheelchair bound). Patients were recruited from GPs working in Dutch primary care between March 2009 and September 2011. Patients who meet the eligibility criteria and complete the consent to participate were included in the study.

#### Method

**BACE-N:** At baseline all patients responded to a comprehensive questionnaire and went through a standardized physical examination conducted by local research assistants at test

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

stations established within each recruiting area. Follow-up questionnaires will be sent at 3, 6, and 12 months after inclusion for completion at home. All questionnaires are preferably completed electronically using the Infopad system, but paper versions will be available for patients not familiar with electronic data collection. All information will be stored and analysed securely through Service for sensitive data (TSD) at the University of Oslo, Norway.

BACE-D: At baseline all patients responded to a comprehensive questionnaire and went through a standardized physical examination. Follow-up questionnaires were sent (by e-mail or postal) at 3, 6, 9 and 12 months after inclusion.

## Variables

### Outcome variable

The outcome of this study is costs related to healthcare utilization aggregated for one year of follow up and dichotomized as high and low. Having high costs related to healthcare utilization is defined as patients with costs in the top 25<sup>th</sup> percentile [2, 3].

Healthcare utilization within the BACE-N and the BACE-D will be self-reported and include; consultation to healthcare professionals (type and frequency), number of diagnostic examinations (type and frequency), number of days of hospitalization and/or institutionalisation (only included in the BACE-N), back operations and use of back medication (both prescription and over-the-counter, type and frequency). All variables, except back operations, will be reported with a 3 month recall period at 3, 6, and 12 months follow-up for the BACE-N, at 3, 6, 9, and 12 months follow-up for the BACE-D. Back operations will be reported with a 12 month recall period at 12 months follow-up.

Healthcare utilization during the one year of follow-up will be described as shown in table 3 (BACE-N and BACE-D). The total cost of healthcare utilization will be estimated based on information presented in table 3 and unit costs of healthcare resources collected from national pricelists in Norway and the Netherlands (see table 1).

### Potential modifiable prognostic factors

Potential modifiable prognostic factors are factors expected to have the potential to be modified *through healthcare system encounters* and therefore classified as modifiable. Potential modifiable prognostic factors of high-costs related to healthcare utilization are based on previous literature and will be measured at baseline.

- Pain severity [2-7] measured by the NRS
- Disability [2-6, 8] measured by the RMDQ
- Health-related quality of life [6, 7] measured by the SF36 using the physical and mental summary score
- Emotional well-being [2, 3, 8-10] measured by the CES-D
- Kinesiophobia [3, 10] measured by the FABQ-PA
- Comorbidity [11] measured by the SCQ
- Radiating pain below the knee [3] measured by the question “did your back pain radiate to your legs last week? If yes, how far down did the pain radiate last week?” categorized into yes or no

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

- Expectations of recovery measured with a five-point scale

The Numeric Rating Scale (NRS) will be used to measure average pain severity last week [12]. The NRS, scored from 0 (no pain) to 10 (maximum pain), has been widely used to evaluate pain and has proven to be preferable when examining low back pain patients [13], also for Norwegian patients [14].

The Roland Morris Disability Questionnaire (RMDQ) [15] will be used to measure disability. The RMDQ is a widely used back-specific patient-reported measure of pain-related disability (0 = no disability, 24 = totally disabled). The Norwegian version has been validated and found to have good measurement properties when used among patients with low back pain [14, 16].

The Short Form-36 Health Status Questionnaire (SF36) [17] will be used to assess health-related quality of life. The SF36 consist of 36 items. It measures health on eight multi-item dimensions, covering physical functioning, social functioning, role limitations (physical problems), role limitations (emotional problems), mental health, vitality, pain, and overall evaluation of health [17]. Data-completeness of the SF36 in the general population in Norway seems to strongly declined with increasing age [18]. Hence, caution should be exercised when assessing subjective health or employing the norms among subjects aged 70 years or over [18].

The Center for Epidemiologic Studies Depression Scale (CES-D) will be used to assess emotional well-being. The CES-D has been widely used in studies of late-life depression. Psychometric properties are generally favourable [19]. The Norwegian version of the CES-D has been used among older patients in order to measure depression symptoms [20].

The Fear Avoidance Beliefs Questionnaire, physical activity subscale (FABQ-PA) [21] will be used to assess kinesiophobia. The FABQ-PA consists of four questions aimed towards physical activity, scored on a 7-point ordinal scale, which are summed up to a sum score, ranging from 0 (no fear) to 24 (maximum fear). The questionnaire has been translated into Norwegian and has shown acceptable psychometric properties in Norwegian patients with low back pain [22].

The Self-Administered Comorbidity Questionnaire (SCQ) [23] will be used to assess comorbidity. The SCQ is a 14-item measure of comorbidity for clinical and health services research settings. An individual can receive a maximum of 3 points for each medical condition: 1 point for the presence of the problem, another point if he/she receives treatment for it, and an additional point if the problem causes a limitation in functioning. Because there are 12 defined medical problems and 3 optional conditions, the maximum score totals 45 points if the open-ended items are used and 36 points if only the close-ended items are used.

#### Potential covariates

Potential covariates will be included in the analyses based on previous literature and will be measured at baseline.

- Sex [4-6, 24, 25]

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

- Age [4, 6, 24, 25]
- Education level [8, 26] measured as the highest education completed, categorised into high vs low (low consists of up to high school and occupational high school)
- Employment status measured by the question “do you have a paying job?” categorized into yes or no
- Pain duration [2] measured by the question “how many days have you had your current back pain?”
- Pain history [5] measured by the question “have you had back pain before?” categorized into yes or no
- First healthcare provider [27]
- Costs related to healthcare utilization prior to inclusion

Healthcare utilization prior to inclusion will be measured (with variables as described above) at baseline, in the period from baseline to 6 and 12 weeks retrospectively, for the BACE-N and the BACE-D study respectively. The total cost of healthcare utilization will be estimated as described above.

#### Other variables

Included patients (BACE-N and BACE-D) will be described with respect to the following baseline characteristics: ethnicity, pain location and healthcare utilization prior to inclusion (see table 2). In addition, we have included the following potential prognostic factors and covariates (as described above): age, gender, educational level, employment status, first healthcare provider, pain severity, pain duration, pain history, disability, health-related quality of life, emotional well-being, kinesiophobia, expectation of recovery and comorbidity.

## 5. Statistical analyses

#### General analysis considerations

All analyses described in this plan are considered a priori in that they have been defined in the protocol and/or in this SAP. All post hoc analyses will be identified as such in the article if relevant. All analyses will be carried out by a PhD-student using SPSS version 26 and controlled by a senior researcher/statistician. All statistical tests will be two-sided, and nominal p-values will be reported. All confidence intervals will be reported as 95%. Preliminary analyses assessing the influence of missing data and assumptions of normality for continuous variables will be conducted. The assumption of normal distribution will be investigated using histograms and QQ-plots. Normally distributed data will be presented with means and standard deviations (SDs), skewed data with medians and interquartile range (IQR). Categorical data will be reported as counts and percentages. Missing data will be handled by multiple imputation, using 5 imputations and 10 iterations unless the missingness exceeds 30% and missing at random cannot be assumed. Fully conditioned specification method and regression estimation will be used. For variables where we are unable to use regression estimation due to computational difficulties, predictive mean matching will be used [28].

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

### Description of study flow

The flow of participants through the study will be reported according to the STROBE guidelines [29] with a flow chart (see figure 1). Reasons for dropout will be provided where known. Differences between responders and non-responders will be evaluated.

### Participant characteristics

Baseline characteristics of included patients will be presented as shown in table 2.

### Preparatory analysis

First, type and frequency of use of different healthcare resources will be calculated for each of the follow-up periods; from baseline to 3 months, 3 to 6 months, and 9 to 12 months for the BACE-N study, and from baseline to 3 months, 3 to 6 months, 6 to 9 months, and 9 to 12 months for the BACE-D. Healthcare utilization will be presented as shown in table 3.

Next, costs will be estimated based on information presented in table 3, and unit costs of healthcare resources collected from national pricelists in Norway and the Netherlands (see table 1). Costs related to back medication will be estimated based on medication type (not exact medication name) and frequency of use. Data on dosage is not available. All costs will be presented in Euros (€) 2020. Costs of healthcare utilization will be described with median and interquartile range for the entire follow-up period as shown in table 4.

### Identification analysis

Univariable and multivariable binary logistic regression models will be used to investigate individual association (crude and adjusted for selected covariates) between each predefined prognostic factor and costs related to healthcare utilization (within the BACE-N). The cost score will be entered into the model as a dependent dichotomous variable (high cost defined as patients with cost in the top 25<sup>th</sup> percentile, yes/no). The results will be presented as crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) as shown in table 5.

### Replication analysis

Univariable and multivariable binary logistic regression models will be used, as described above, to replicate findings from the identification analysis within the BACE-D material. The results will be presented as crude and adjusted odds ratios (OR) with 95% confidence intervals (CI) as shown in table 5. The decision on whether findings are replicated will be based on the size and direction of the association, the confidence interval and the p-value for each of the predefined prognostic factors [30].

### Sample size

This study contains secondary analyses embedded in the BACE-N and the BACE-D study. Details on sample size calculation are provided in the BACE-N (ClinicalTrials.gov Identifier: NCT04261309) and the BACE-D protocol [1].

To determine statistical power of this study we used number of events per variable (EPV) [46-50] and the rule-of-thumb of "10 events per 1 analysed variable" [51-54]. With a sample size of 450 participants within the BACE-N study, we anticipate 112 participants to be in the top 25<sup>th</sup> percentile of costs due to healthcare utilization and categorised as having high costs (yes/no) due to healthcare utilization (events). An EPV of 10 will allow a maximum of 11 prognostic variables to be included in

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

the final multivariable prediction model. With a sample size of 675 participants in the BACE-D, we anticipate 168 participants to be in the top 25<sup>th</sup> percentile of costs due to healthcare utilization and defined as having high costs (yes/no) due to healthcare utilization (events). An EPV of 10 will allow a maximum of 16 prognostic variables to be included in the final multiple prediction model.

#### Sensitivity analysis

To assess the robustness of the results complete case analysis (without using imputation for missing data) will be carried out as a sensitivity analysis.

## 6. Selection bias, information bias and covariates

#### Selection bias:

Because of limited resources and practical reasons related to recruitment from a broad network of clinicians, the BACE-N and the BACE-D lacks information on eligible study participants that declined to participate or for other reasons were not invited. In order to assess representativeness, the BACE-N study sample will be compared on key sociodemographic variables with a sample from the longitudinal population study of people in the second half of life; The Norwegian study on life course, ageing and generation (NORLAG). The NORLAG study is expected to represent a representative sample of older people with musculoskeletal complaints.

Response rate at each assessment point and reasons for loss to follow-up will be reported. Key baseline characteristics will be compared between those lost to follow-up and those remaining in the study.

#### Information bias:

To reduce the risk of information bias, the study outcome (costs) will be measured in an identical manner in all included cases, and in the best possible way within the framework of the BACE-N and the BACE-D study.

#### Covariates:

Covariates may influence associations between prognostic factors and outcome. Therefore, in line with the PROGRESS framework and recommendations for type 2 studies [31], we will adjust for covariates when evaluating prognostic factors.



SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

**Table 1 Cost categories, units, unit price, all numbers in Euros (€) for 2020?**

Cost categories	Unit	Norwegian unit price (€)	Dutch unit price (€)	Reference (source)
<i>Primary care</i>				
General practitioner	Per visit			
Medical specialist	Per visit			
Occupational physician	Per visit			
Physiotherapist	Per visit			
Chiropractor	Per visit			
Manuel therapist	Per visit			
Naprapath	Per visit			
Osteopath	Per visit			
Psychologist	Per visit			
Other therapists	Per visit			
<i>Back medication</i>				
Paracetamol	Per daily defined dose			
NSAID	Per daily defined dose			
Muscle relaxant	Per daily defined dose			
Sleep medication	Per daily defined dose			
Cortisone	Per daily defined dose			
Opioid	Per daily defined dose			
Antidepressant	Per daily defined dose			
Anticonvulsant	Per daily defined dose			
Others	Per daily defined dose			
<i>Examinations</i>				
Blood sample	Per examination			
X-ray	Per examination			
MRI	Per examination			
CT	Per examination			
Others??	Per examination			
<i>Secondary care</i>				
Back operation	Per operation			
Hospitalization (non-operation)	Per day			
Rehabilitation stay	Per day			

NoMA, Norwegian Medicines Agency

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

**Table 2 Patient characteristics and clinical status at baseline**

	BACE-N (n = x)	BACE-D (n = x)
Female, N (%)		
Age in years, mean (SD)		
Education level high, N (%)		
Ethnicity Norwegian (BACE-N) or Dutch (BACE-D), N (%)		
Employment status, N (%)		
Currently paid work		
First healthcare provider, N (%)		
General practitioner		
Physiotherapist		
Chiropractor		
Pain location, N (%)		
Lumbar		
Thoracic		
Radiating pain below the knee		
Average pain severity last week (NRS 0-10), median (IQR)		
Pain duration, N (%)		
< 6 weeks		
6 weeks to 3 months		
> 3 months		
Previous episodes of back pain, N (%)		
Disability (RMDQ 0-24), mean (SD)		
Comorbidity (SCQ, 0-15)		
Health-related QOL (SF36, 0-100), mean (SD)		
Physical component		
Mental component		
Emotional well-being (CES-D 0-60)		
Kinesiophobia (FABQ-PA 0-24)		
Expectation of recovery within 3 months, N (%)		
Fully recovered		
Much better		
No change or worse		
<i>Healthcare utilization prior to inclusion</i>		
Patients with primary care consultation last 6 (BACE-N) or 12 (BACE-D) weeks, N (%)		
General practitioner		
Medical specialist		
Occupational physician		
Physiotherapist		
Chiropractor		
Manual therapist		
Naprath		
Psychologist		
Other therapists		
Patients with use of back medication, N (%)?		
Patients with diagnostic examination last 6 (BACE-N) or 3 (BACE-D) months, N (%)		
Blood sample		
X-ray		
MRI/CT scan		
Patients with previous hospitalization, N (%)		
Patients with previous rehabilitation stay, N (%)		

NRS indicates Numeric Rating Scale; RMDQ, The Roland Morris Disability Questionnaire; SCQ, The Self-Administered Comorbidity Questionnaire; SF-36, 36-Item Short-Form Health Survey; CES-D, The Center for Epidemiologic Studies Depression Scale; FABQ-PA, The Fear Avoidance Beliefs Questionnaire, physical activity subscale.

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

**Table 3 Healthcare utilization throughout one-year of follow-up**

	BACE-N			BACE-D			
	0-3 months	>3-6 months	>9-12 months	0-3 months	>3-6 months	>6-9 months	>9-12 months
<i>Primary care</i>							
Patients with primary care consultation, N (%)							
General practitioner							
Medical specialist							
Occupational physician							
Physiotherapist							
Chiropractor							
Manual therapist							
Naprath							
Psychologist							
Other therapists							
No. of general practitioner consultations, median (IQR)							
No. of medical specialist consultations, median (IQR)							
No. of occupational physician consultations, median (IQR)							
No. of physiotherapist consultations, median (IQR)							
No. of chiropractor consultations, median (IQR)							
No. of manual therapist consultations, median (IQR)							
No. of naprath consultations, median (IQR)							
No. of psychologist consultations, median (IQR)							
No. of other consultations, median (IQR)							
<i>Back medication</i>							
Patients with use of back medication, N (%)							
Paracetamol							
NSAID							
Muscle relaxants							
Sleep medication							
Cortisone							
Opioid							
Others							
Frequency of use paracetamol, N (%)							
Daily							
Weekly							
Monthly or less							
Frequency of use NSAID, cortisone N (%)							
Daily							
Weekly							
Monthly or less							
Frequency of use muscle relaxants, sleep medication, N (%)							
Daily							
Weekly							
Monthly or less							
<i>Examinations</i>							
Patients with additional diagnostic examination, N (%)							
Blood sample							
X-ray							
MRI/CT scan							
Others							
<i>Secondary care</i>							
Patients with back operation, N (%)							
Patients with hospitalization, N (%)							
Duration of stay in days, median (IQR)							
Patients with rehabilitation stay, N (%)							
Duration of stay in days, median (IQR)							

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

**Table 4 Cost related to healthcare utilization from 0-12 month\***

	BACE-N	BACE-D
<i>Primary care</i>		
General practitioner		
Medical specialist		
Occupational physician		
Physiotherapist		
Chiropractor		
Manual therapist		
Naprapath		
Psychologist		
Other therapists		
<i>Back medication</i>		
Paracetamol		
NSAID, cortisone		
Muscle relaxants, sleep medication		
<i>Examinations</i>		
Blood sample		
X-ray		
MRI		
CT		
Others		
<i>Secondary care</i>		
Back operation		
Hospitalization and/or rehabilitation stay		
<b>Total costs</b>		
Values are median (interquartile range) of costs (€). *Cost related to healthcare utilization for the entire follow-up period is calculated on basis of the three (BACE-N) and four (BACE-D) follow-up periods		

**Table 5 Binary logistic regression analyses; individual associations between modifiable prognostic factors and high costs related to healthcare utilization (dependent variable)**

	BACE-N		BACE-D	
	Crude OR (95% CI)	Adjusted OR* (95% CI)	Crude OR (95% CI)	Adjusted OR* (95% CI)
Pain severity (NRS, 0-10)				
Disability (RMDQ, 0-24)				
Health-related QOL (SF36, 0-100)				
Physical component				
Mental component				
Emotional well-being (CES-D 0-60)				
Kinesiophobia (FABQ-PA 0-24)				
Comorbidity (SCQ, 0-15)				
Radiating pain below the knee				
Yes				
No				
Expectation of recovery within 3 months, N (%)				

OR indicates odds ratio; CI, confidence interval; NRS, Numeric Rating Scale; RMDQ, The Roland Morris Disability Questionnaire; SF-36, 36-Item Short-Form Health Survey; CES-D, The Center for Epidemiologic Studies Depression Scale; FABQ-PA, The Fear Avoidance Beliefs Questionnaire, physical activity subscale; SCQ, The Self-Administered Comorbidity Questionnaire. \*Adjusted by gender, age, education level, employment status, pain duration, pain history and costs related to healthcare utilization prior to inclusion.

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

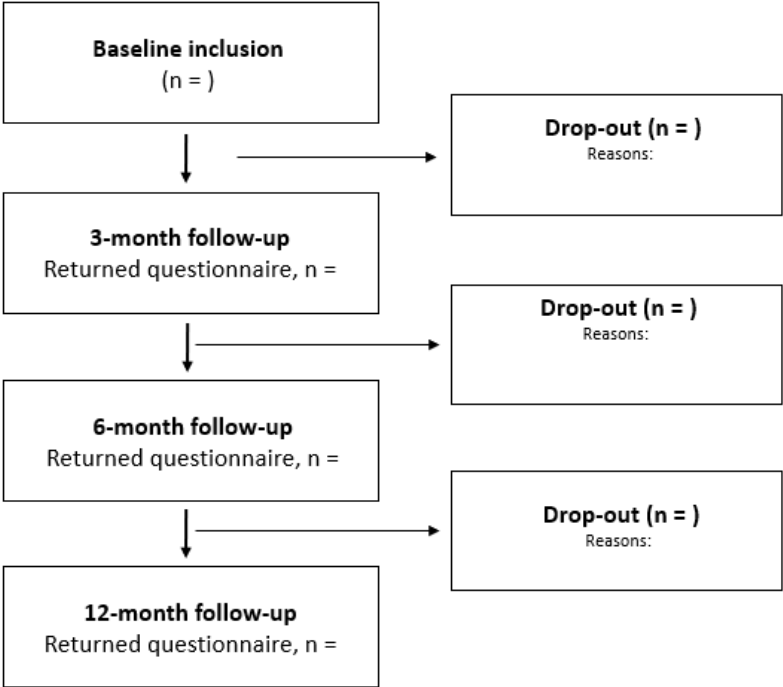


Figure 1. Flow chart of the study

## References

1. Scheele, J., et al., *Back complaints in the elders (BACE); design of cohort studies in primary care: an international consortium*. BMC Musculoskelet Disord, 2011. **12**: p. 193.
2. Engel, C.C., M. von Korff, and W.J. Katon, *Back pain in primary care: predictors of high health-care costs*. Pain, 1996. **65**(2-3): p. 197-204.
3. Becker, A., et al., *Low back pain in primary care: costs of care and prediction of future health care utilization*. Spine (Phila Pa 1976), 2010. **35**(18): p. 1714-20.
4. Wenig, C.M., et al., *Costs of back pain in Germany*. Eur J Pain, 2009. **13**(3): p. 280-6.
5. Ferreira, M., et al., *Factors defining care-seeking in low back pain - A meta-analysis of population based surveys*. European Journal of Pain, 2010. **14**(7): p. 747.e1-747.e7.
6. Mutubuki, E.N., et al., *Predictive factors of high societal costs among chronic low back pain patients*. Eur J Pain, 2019.
7. Lentz, T.A., et al., *Factors associated with persistently high-cost health care utilization for musculoskeletal pain*. PLoS One, 2019. **14**(11): p. e0225125.
8. Lim, K.L., P. Jacobs, and S. Klarenbach, *A population-based analysis of healthcare utilization of persons with back disorders: results from the Canadian Community Health Survey 2000-2001*. Spine (Phila Pa 1976), 2006. **31**(2): p. 212-8.
9. Stewart, W.F., et al., *Patterns of health care utilization for low back pain*. J Pain Res, 2015. **8**: p. 523-35.
10. Keeley, P., et al., *Psychosocial predictors of health-related quality of life and health service utilisation in people with chronic low back pain*. Pain, 2008. **135**(1-2): p. 142-50.
11. Ritzwoller, D.P., et al., *The association of comorbidities, utilization and costs for patients identified with low back pain*. BMC Musculoskelet Disord, 2006. **7**: p. 72.
12. Von Korff, M., M.P. Jensen, and P. Karoly, *Assessing global pain severity by self-report in clinical and health services research*. Spine (Phila Pa 1976), 2000. **25**(24): p. 3140-51.
13. Strong, J., R. Ashton, and D. Chant, *Pain intensity measurement in chronic low back pain*. Clin J Pain, 1991. **7**(3): p. 209-18.
14. Grotle, M., J.I. Brox, and N.K. Vollestad, *Concurrent comparison of responsiveness in pain and functional status measurements used for patients with low back pain*. Spine (Phila Pa 1976), 2004. **29**(21): p. E492-501.
15. Roland, M. and R. Morris, *A study of the natural history of back pain. Part I: development of a reliable and sensitive measure of disability in low-back pain*. Spine (Phila Pa 1976), 1983. **8**(2): p. 141-4.
16. Grotle, M., J.I. Brox, and N.K. Vollestad, *Cross-cultural adaptation of the Norwegian versions of the Roland-Morris Disability Questionnaire and the Oswestry Disability Index*. J Rehabil Med, 2003. **35**(5): p. 241-7.
17. Ware, J.E., Jr. and C.D. Sherbourne, *The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection*. Med Care, 1992. **30**(6): p. 473-83.
18. Loge, J.H. and S. Kaasa, *Short form 36 (SF-36) health survey: normative data from the general Norwegian population*. Scand J Soc Med, 1998. **26**(4): p. 250-8.
19. Radloff, L.S., *The CES-D scale: a Self-Report Depression Scale for Research in the General Population*. Applied psychological measurement, 1977. (1(3)): p. 385-355.
20. SE., T.K.C., *Funksjonshemning, ensomhet og depresjon: Hva betyr ensomhet for om personer med funksjonshemning opplever depresjon?* Tidsskrift Norsk Psykologforening, 2008. **1**.
21. Waddell, G., et al., *A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability*. Pain, 1993. **52**(2): p. 157-68.
22. Grotle, M., J.I. Brox, and N.K. Vollestad, *Reliability, validity and responsiveness of the fear-avoidance beliefs questionnaire: methodological aspects of the Norwegian version*. J Rehabil Med, 2006. **38**(6): p. 346-53.

SAP Modifiable prognostic factors of high cost related to healthcare utilization among older people seeking primary care with a new episode of back pain - an identification and replication study (working title)

23. Sangha, O., et al., *The Self-Administered Comorbidity Questionnaire: a new method to assess comorbidity for clinical and health services research*. *Arthritis Rheum*, 2003. **49**(2): p. 156-63.
24. Rattay, P., et al., *[Utilization of outpatient and inpatient health services in Germany: results of the German Health Interview and Examination Survey for Adults (DEGS1)]*. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz*, 2013. **56**(5-6): p. 832-44.
25. Chechulin, Y., et al., *Predicting patients with high risk of becoming high-cost healthcare users in Ontario (Canada)*. *Healthc Policy*, 2014. **9**(3): p. 68-79.
26. Hoebel, J., et al., *Socioeconomic Status and Use of Outpatient Medical Care: The Case of Germany*. *PLoS One*, 2016. **11**(5): p. e0155982.
27. Fritz, J.M., J. Kim, and J. Dorius, *Importance of the type of provider seen to begin health care for a new episode low back pain: associations with future utilization and costs*. *J Eval Clin Pract*, 2016. **22**(2): p. 247-52.
28. Van Buuren, S., *Flexible imputation of missing data*. 2018: CRC press.
29. von Elm, E., et al., *The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies*. *PLoS Med*, 2007. **4**(10): p. e296.
30. Kent, P., et al., *A conceptual framework for prognostic research*. *BMC Med Res Methodol*, 2020. **20**(1): p. 172.
31. Riley, R.D., et al., *Prognosis Research Strategy (PROGRESS) 2: prognostic factor research*. *PLoS Med*, 2013. **10**(2): p. e1001380.