NemPRO-2: A patient-reported outcome (PRO) questionnaire tailored for stroke survivors with aphasia.
Development, validation and evaluation.

Background

Stroke and life after stroke

Approximately 12,000 Danes annually suffer a stroke (1). The burden of stroke is substantial not only for stroke survivors and their families but also for society as both the direct and indirect costs of stroke are considerable (2, 3). A brain injury can cause physical, emotional, behavioral and cognitive difficulties. Several of the consequences of a brain injury become visible after a while. In the initial phase after a stroke, focus will often be on the physical disabilities and their rehabilitation for both the family and the one who suffers the stroke. Families usually often become aware of the more hidden disabilities later (1). These visible consequences of a brain injury are paresis and aphasia. The hidden consequences are cognitive disorders (4, 5). Problems with memory and concentration, lack of overview and initiative, inattention and fatigue can occur. Often the hidden disabilities present the biggest problems. They can be difficult to understand for the caregivers, and often the person with cognitive impairments will not be able to describe them. Several of the hidden disabilities only become apparent when the patient returns to everyday life and the complexity of the requirements for the patient increases. When difficulties and changes become recognized, the stroke survivor often feel a severe feeling of loss and grief, (4, 5). Approximately four out of ten stroke survivors suffer from cognitive impairment the first-year post-stroke (6) and studies has reported that about 35% suffer from aphasia (7).

Involvement of patients and relatives is a fundamental ethical and democratic principle in the Danish healthcare system and is indisputable from a human and ethical perspective with respect for patients' personal and bodily integrity, self-determination and rights.

Patient Reported Outcome

Patient Reported Outcome (PRO) is an increasingly used tool in healthcare, with aim of including patient perspectives to secure the quality of care and treatment, guide prioritisation of resources and treatment and guide research and development of services. PRO data are often collected using questionnaires, typically conducted electronically via the Internet (8) exploring questions related to a patient's health, physical and mental symptoms and health-related quality of life, how the patient is performing in everyday life from the patients point of view. PRO is intended to secure valuable collaboration and a qualified dialogue between healthcare professionals and patients and relatives to ensure tailored care and treatment for patients. When answering a PRO questionnaire, patients become more involved in their own treatment and care (8). The use of PRO however poses a challenge for specific populations, e.g. stroke patients with aphasia, because of cognitive or communicative disorders, making it difficult filling out a questionnaire (9,10,11). Furthermore the scientific literature shows that older people, people with hearing or vision problems and those with poor social status have difficulties when reporting PRO data (12,13). This disproportionality implies a potential risk for inequality in healthcare.

National regulations regarding patient reported outcomes

The Danish Regions National Quality Program describes that a national dissemination of systematic use of patient-reported information in the healthcare system both in the direct patient treatment and for quality follow-up and development must be ensured (14). This has led to several national studies using PRO within different diagnostic groups.

In 2017, the Danish Health Authority launched a project to implement PRO in the field of stroke called ApoPRO-58 containing 58 questions. It was decided to develop an IT-based questionnaire to be used before the three-month outpatient clinic consultation at stroke wards in a hospital setting or as a follow-up examination in a rehabilitation setting in the municipalities (14,15). The goal was to develop a tool that could ensure a thorough coverage of treatment- and rehabilitation needs of stroke survivors, including cognitive, emotional, social and behavioural changes (15). The questions were chosen to make sure that the following thematic areas were covered: physical functionality, well-being (WHO5), nutrition, pain, spare time/leisure activities, loneliness (UCLA loneliness scale), communication and cognitive function. It also contained 11 questions that were developed for the purpose of the questionnaire or "borrowed" from existing scales. These questions covered the stroke survivors experience with previously uncovered areas of disabilities following stroke (e.g. difficulties drinking, reading, going to the bathroom etc last 30 days, experience of pain last 30 days, worries about another stroke, and a question addressing a potential need to talk about a specific area of choice). Evaluation of the ApoPRO-58 showed there was several challenges though including that a large number of stroke survivors couldn't use the questionnaire (15).

NemPRO

Therefore, a more communication-friendly version of ApoPRO-58 was developed. NemPRO with 26 questions was developed based on knowledge about supported communication aiming at reducing barriers for the abovementioned groups to ensure patient involvement and reduce inequality. The project was carried out in collaboration between the Department of Neurology at Rigshospitalet, the Centre for Communication, Capital Region of Denmark and the PRO secretariat, and tested in 33 stroke survivors in 2018. The conclusion of this pilot-test was that stroke survivors with even moderate-severe aphasia were able to answer and navigate the NemPRO-questionnaire (16). However, the items in the NemPRO-pilot was never validated. The national steering group for implementation of PRO recommended that further work with PRO in the field of stroke should be based on the NemPRO-questionnaire and not ApoPRO-58.

The aim of this project is to develop and evaluate an electronic PRO-questionnaire tailored for stroke survivors with aphasia.

The new PRO-questionnaire, NemPRO-2, will be based on the NemPRO-questionnaire. The NemPRO-questionnaire and its containing questions/items will be further developed and adjusted based on existing literature, and then validated in the stroke outpatient clinics at the Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital, Roskilde.

Subsequently NemPRO-2 will be incorporated in the electronic patient record "Sundhedsplatformen", and the evaluation will be made through the "MinSundhedsplatform"-function (patient platform in "Sundhedsplatformen"), where the questionnaire will be dispatched to the stroke survivors. NemPRO-2 will be adjusted to the practical limitations and possibilities in "Sundhedsplatformen", eg. setup, available

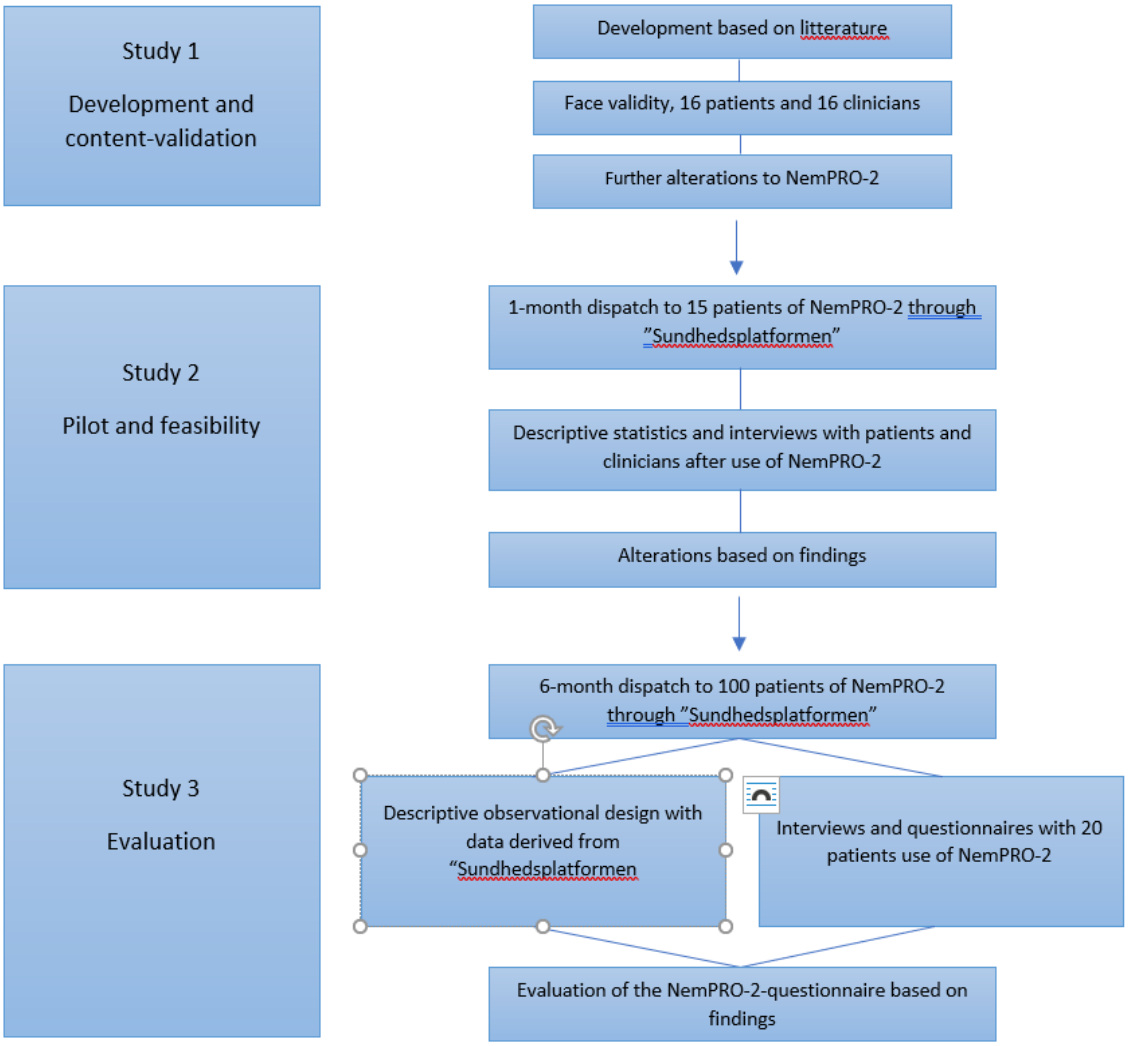
colour scheme etc. Therefore, the project will be coordinated with the technical personal at Center for It, Medico & Telephony (CIMT), Capital Region of Denmark that is going to integrate the PRO- questionnaire into Sundhedsplatformen. The accessibility of the NemPRO-2 through "Sundhedsplatformen" and "MinSundhedsplatform" will be evaluated.

Aim

The overall aim of the program is to develop and evaluate an electronic PRO-questionnaire tailored for stroke survivors with aphasia.

Methods and procedures

The overall design is a multi-method study drawing on both quantitative and qualitative methods. Interventions in healthcare are complex and they comprise several components (17, 18). The design follows the UK Medical Research Council's (MRC) strategy for developing and evaluating complex interventions (18) consisting of four phases in a circular strategy. The framework has been recommended and found useful (17) for developing interventions in healthcare, and it will guide the structure of the present project. The study will consist of three sub-studies aligned with the MRC framework' first the three first phases: development, piloting and feasibility and evaluation:



Study 1: Development and content-validation

Aim:
To tailor the NemPRO-questionnaire into NemPRO-2, by identification of additional items, developing algorithms and test content validity with people with aphasia and clinicians.

Method:
Further development of NemPRO. Will add to and adopt items in the NemPRO-questionnaire based on literature on aphasia friendly principles, IT illiteracy and computer accessibility, with special focus on the challenges people with aphasia face when accessing a questionnaire electronically via computer. NemPRO-2 will be adjusted to the practical limitations and possibilities in "Sundhedsplatformen", eg. Setup, available color scheme etc.
Content validity will be sought to make sure the items in the questionnaire are appropriate according to the underlying theme and purpose to uncover hidden disabilities, to secure layout availability and secure understanding of the questionnaire. Content validation will be secured by assessing face validity by interviewing 16 patients with aphasia and 16 clinicians to probe item relevance on item-level to secure content relevance as well as reviewing the entire questionnaire. The patients with aphasia will fill out the electronic questionnaire with a researcher present. Interviews will be conducted in an aphasia-friendly matter to support communication between the interviewer and the people with aphasia when necessary.

Sampling:
A sample of 16 heterogenous patients with aphasia (age gender, severity of stroke and aphasia etc) will be recruited during: 1) hospitalization at the stroke clinics at Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital - Roskilde, 2) at the stroke outpatient clinics at Rigshospitalet Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde and 3) through Centre for Communication, Capital Region of Denmark.

At Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde the nursing staff/speech language pathologists will obtain the consent during hospitalization and in a follow-up at the in-patient stroke clinic. Participants will receive written and verbal information about the study, and information about how to withdraw consent. When necessary aphasia-friendly consent-forms will be handed out and explained in an aphasia-friendly matter.

At Centre for communication at the Capital Region of Denmark the speech language pathologists and the neuropsychologists will obtain consent. Participants will receive written and verbal information about the study, and information about how to withdraw consent. When necessary aphasia-friendly consent-forms will be handed out and explained in an aphasia-friendly matter.

When patient consent is obtained, consent to contact significant others or relevant contact persons to the person with aphasia is also obtained. The significant others will be contacted in order to help arrange a time for the interviews.

A sample of 16 clinicians (doctors, nurses, neuropsychologists and speech and language pathologists) will be recruited at Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde.

Clinicians participating will receive written and verbal information about the study, and information about how to withdraw consent.

Outcome:
Based on the study the NemPRO-2-questionnaire will be adjusted and incorporated in the electronic patient record "Sundhedsplatformen" ready for further validation and reliability testing as well as clinical testing.

Study 2: Pilot and feasibility test

Aim:
To conduct a pilot and feasibility test to test the NemPRO-2 intervention for methodological, procedural and clinical uncertainty and adjust accordingly.

Method:
The pilot and feasibility test will be evaluated using both quantitative and qualitative methods. NemPRO-2 is feasibility and pilot tested during a 1 month-period corresponding to the dispatch of NemPRO-2 electronically through "Sundhedsplatformen". The NemPRO-2 will be dispatched to approximately 15 patients with aphasia as part of their follow-up in the stroke outpatient clinics in the Department of Neurology, Rigshospitalet and the Department of Neurology, Zealand University Hospital, Roskilde. When informed consent has been received the patients will receive NemPRO-2 prior to a 3-month follow up at the stroke outpatient clinics. The patients will fill out the questionnaire at home. Clinicians receiving the filled out NemPRO-2-quesstionnaire through "Sundhedsplatformen" and conducting the 3-month stroke outpatient clinical follow-ups will be interviewed regarding the use of the questionnaire. Lastly the patients will be interviewed afterwards. The interviews will be conducted in an aphasia-friendly matter to support communication between the interviewer and the people with aphasia when necessary.

Sampling:
A sample of approximately 15 patients will participate in the study. The patients will be recruited during hospitalisation in the stroke outpatient clinics at the Department of Neurology at Rigshospitalet and the Department of Neurology, Zealand University Hospital, Roskilde. At Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde the nursing staff/speech language pathologists will obtain the consent during hospitalization and in a follow-up at the in-patient stroke clinic. Participants will receive written and verbal information about the study, and information about how to withdraw consent. When necessary aphasia-friendly consent-forms will be handed out and explained in an aphasia-friendly matter.

When patient consent is obtained, consent to contact significant others or relevant contact persons to the person with aphasia is also obtained. The significant others will be contacted with information of the dispatch of the NemPRO-2-questionnaire through "Sundhedsplatformen" and how to support the patient in filling out the questionnaire if relevant.

Clinicians will be recruited at the stroke outpatient clinics at Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde.

Clinicians participating will receive written and verbal information about the study, and information about how to withdraw consent.

Outcome:
The feasibility and pilot test will provide answers to:

- Acceptability (patients/healthcare professionals).
- Healthcare professional's willingness on the project and adherence to the protocol.
- Recruitment.
- Time resources required (for healthcare professionals and patients).
- Estimates of the parameters used to calculate sample size for the definitive trial.
- Responsiveness of outcomes.
- Volume of missing data.
- Technical performance.

NemPRO-2 will be adjusted accordingly to test results, prior to a large-scale evaluation through "Sundhedsplatformen". Based on the validation and reliability study the NemPRO-2-questionnaire will be adjusted and these adjustments will be incorporated in the electronic patient record "Sundhedsplatformen ready for clinical testing.

Study 3: Evaluation

Aim:
To evaluate the NemPRO-2 questionnaire.

Method:
Data collection takes place using both quantitative (descriptive statistics, questionnaires) and qualitative (interviews) methods. NemPRO-2 will be dispatched to approximately 100 patients with aphasia as part of their follow-up in the stroke outpatient clinics in the Department of Neurology, Rigshospitalet and the Department of Neurology, Zealand University Hospital, Roskilde during a 6-month period. When informed consent has been received the patients will receive the NemPRO-2-questionnaire through "Sundhedsplatformen" prior to a 3-month follow up at the stroke outpatient clinics.

Evaluation of NemPRO-2 will be using both quantitative and qualitative methods in relation to the following in a descriptive observational design, with data extracted from the "Sundhedsplatformen":

1. Number of patients using the NemPRO-2-questionnaire
2. The number of patients who are or are not able to respond to the NemPRO-2 in relation to the following:
   - Severity of their injury after stroke.
   - Cognitive impairment.

- Language impairment.
- Danish as a second language.
- Comorbidities.
- Social status.

As a second evaluation point, NemPRO-2 will be investigated based on questionnaires and interviews with the patients (experience with NemPRO-2, Patient centring (CARE, PEQ (19, 20)), emotions after consultation (PANASSF (21, 22))). Approximately 20 patients will be recruited to participate in the interviews and filling out the questionnaires.

Sampling:
The patients will be recruited during hospitalisation in the stroke outpatient clinics at the Department of Neurology at Rigshospitalet and the Department of Neurology, Zealand University Hospital, Roskilde. At Department of Neurology Rigshospitalet and the Department of Neurology, Zealand University Hospital – Roskilde the nursing staff/speech language pathologists will obtain the consent during hospitalization and in a follow-up at the in-patient stroke clinic. Participants will receive written and verbal information about the study, and information about how to withdraw consent. When necessary aphasia-friendly consent-forms will be handed out and explained in an aphasia-friendly matter.

When patient consent is obtained, consent to contact significant others or relevant contact persons to the person with aphasia is also obtained. The significant others will be contacted with information of the dispatch of the NemPRO-2-questionnaire through "Sundhedsplatformen" and how to support the patient in filling out the questionnaire if relevant.

Outcome:
The evaluation will provide answers in relation to the following:

- Whether the patients have been able to respond to NemPRO-2
- The number of patients who are or are not able to respond to the NemPRO-2 in relation to: severity of their injury after stroke, cognitive impairment, language impairment, danish as a second language, comorbidities and social status.
- Whether they have been able to respond alone or with the help of relatives.
- Whether it has qualified the conversation with healthcare professionals.
- Whether the patients are satisfied with the conversation and whether they feel a sense of having been involved.
- Whether they know where to access help with respect to the issues that were made visible based on the NemPRO-2-based dialogue.

NemPRO-2 will be adjusted according to evaluation findings, prior to implementation in clinical practice.

Collaboration

The interest for this project is substantial and a suitable PRO for patients with aphasia is highly requested by patients and relatives (The Danish Stroke Association), healthcare professionals (The Danish Stroke

Society) and the Danish Health Authorities. Several interest groups are expected to support and enter into collaborations in relation to this project; for instance, patients association The Danish Stroke Association, The Danish Health Authority, the PRO secretariat, Centre for Communication, Capital Region of Denmark, Department of Neurology, Rigshospitalet, Department of Neurology, Zealand University Hospital, Roskilde and a number of people with special competences regarding linguistics, neuropsychology and IT, will support and collaborate with the project.

Contribution to the State-of Art

The present project is expected to put forward the stroke survivors with aphasias' voice, giving them the ability to communicate concerns and needs and thereby improving equality in decision making and quality of patient consultations.

This will increase patient safety and ensure that patient relevant problems and 'hidden disabilities' are uncovered to a greater extent; this will also help facilitate the initiation of further efforts in improving PRO designs.

This PhD-study will provide important knowledge about accessibility in using electronic PRO-questionnaires and thus contribute to the knowledge about PRO that has the potential to reduce inequality in healthcare and ensure patient involvement in life after stroke. Results from this study will bring both important and nationally and internationally requested knowledge about PRO tools.

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