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Evaluation of an interactive web-based programme on relapse management for people with multiple sclerosis (POWER@MS2): study protocol for a process evaluation accompanying a randomised controlled trial

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ABSTRACT

Introduction Process evaluations accompanying complex interventions examine the implementation process of the underlying intervention, identify mechanisms of impact and assess contextual factors. This paper presents the protocol for a process evaluation conducted alongside the randomised controlled trial POWER@MS2. The trial comprises the evaluation of a web-based complex intervention on relapse management in 188 people with multiple sclerosis conducted in 20 centres. The web-based intervention programme focuses on relapse treatment decision making and includes a decision aid, a nurse-led webinar and an online chat. With the process evaluation presented here, we aim to assess participants' responses to and interactions with the intervention to understand how and why the intervention produces change.

Methods and analysis A mixed methods design is used to explore the acceptance of the intervention as well as its use and impact on participants. Participants are people with multiple sclerosis, neurologists, nurses and stakeholders. Quantitative semistandardised evaluation forms will be collected throughout the study. Qualitative semistructured telephone interviews will be conducted at the end of the study with selected participants, especially people with multiple sclerosis and neurologists. Quantitative data will be collected and analysed descriptively. Based on the results, the qualitative interviews will be conducted and analysed thematically, and the results will be merged in a joint display table.

Ethics and dissemination The process evaluation has received ethical approval from the Ethical Committee of the University of Lübeck (reference 19–024). Findings will be disseminated in peer-reviewed journals, at conferences, meetings and on relevant patient websites.

Trial registration number NCT04233970.

Strengths and limitations of this study

- This thoroughly planned process evaluation will explore the impact of an intervention aiming to improve relapse management and decision-making pathways based on patient empowerment.
- The mixed methods design of this process evaluation and the inclusion of different groups of participants allow for an in-depth understanding of the mechanisms affecting the implementation and exploration of the impact of the intervention on different target groups.
- Findings may help to optimise the implementation of the web-based programme and tailor future interventions to similar contexts (eg, rheumatic diseases or chronic infectious diseases).
- Recruitment especially of physicians could be challenging with a risk of a non-representative selection of participants.
- The fact that only participants will be included in the process evaluation might lead to mostly positive and overoptimistic results.

INTRODUCTION

Multiple sclerosis (MS), a chronic inflammatory and neurodegenerative disease of the central nervous system, is one of the most common neurological disorders and cause of disability in young adults.[1] In 80% of cases, MS presents with a relapsing-remitting disease course,[2 3] which is characterised by relapses, occurring in new or worsening of existing neurological symptoms and periods of recovery between relapses.[4] While the annualised relapse rate is often used as a primary endpoint for MS treatment trials, its prognostic value for long-term disability is weak.[5] In addition, the presentation of relapses is very heterogeneous, and diagnosis is often not straightforward.[6 7] In Germany, early intravenous therapy with high-dose methylprednisolone is the standard

treatment of acute relapses.[8] If symptoms persist after the initial treatment, escalation therapy may be considered. Corticosteroid doses can be increased in a second course, and either plasma exchange or immunoadsorption can be considered.[9] Most inpatient hospital admissions of people with MS (PwMS) are related to the treatment of an acute relapse. However, evidence concerning the benefit of all the mentioned treatment options is limited.[8 9] Corticosteroid therapy leads to an accelerated resolution of relapse symptoms in about 25% of treated patients within 5 weeks, while there is no evidence for long-term benefits.[10 11] This contrasts with the overall relapse treatment perception. While relapses may resolve even without treatment, many physicians in Germany tend to treat every relapse,[12] with any improvements attributed to corticosteroid treatment. The acute medical care paradigm of rather doing something than not giving any drug enhances this attitude.[13]

International guidelines on MS management recommend oral treatment of corticosteroids as the first treatment choice as it is equally clinically effective to intravenous therapy and less costly.[14 15] The current German guideline, which has been revised recently, also points out the evidence that there is no superiority or inferiority of oral versus intravenous corticosteroid therapy.[9 16 17] However, oral treatment is still not considered as first-line treatment, and approved oral high dose methylprednisolone preparations are not available in Germany. Taking these factors into account, relapse treatment decision making is of great relevance but also highly complex. Providing people with a chronic disease like MS with easily accessible and understandable information can support relapse treatment decision making and promote patient empowerment.[1]

To support PwMS in the process of relapse treatment decision making, we developed and are currently evaluating an interactive web-based and evidence-based decision-making programme on relapse management as a complex intervention (POWER@MS2).

The programme focuses on relapse treatment decision making and is evaluated in a prospective, multicentre randomised controlled trial (RCT) with 188 people with active relapsing-remitting MS. Participants of the POWER@MS2 study are assigned to either the intervention or an active control programme. The study is currently being conducted in approximately 20 MS centres and neurological practices throughout Germany, and it runs from January 2020 to June 2022. A multidisciplinary team, consisting of the main study team, the programme developers and stakeholders, is responsible for conducting the study. Stakeholders are PwMS, clinicians and MS experts including a cooperation with patient representatives from the German MS Self-help Society (Deutsche MS Gesellschaft (DMSG)). The study protocol on the RCT has been submitted in a separate publication.[18] This paper presents the detailed planning of a mixed methods process evaluation conducted alongside the RCT.

The design of this process evaluation is guided by the UK Medical Research Council (MRC) process evaluation framework.[19] To understand the functioning of an intervention, the framework highlights the importance of process evaluations for complex interventions.[20] Process evaluations can assist in examining the reasons for success or failure in implementation and unintended consequences and thus help refining interventions to improve their effectiveness.[21] Due to the increasing complexity of trials and the integration of multiple intervention components, it is of great importance for researchers to explore to what extent different components have been implemented and how the individual components interact with each other. Process evaluations help with the interpretation of the intervention outcomes by providing information about the quality and quantity of implementation.[22] This usually involves a mixed methods approach, a combination of qualitative and quantitative research methods.[22 23]

In the development process of the quantitative research methods applied in this process evaluation, the empowerment framework played an essential role. The concept of patient empowerment, which is reflected in many of the questionnaires used in this study, supports patients in gaining more control over health-related decisions through knowledge and participation and promotes a partnership between health professionals and patients that focuses on a respectful provision of healthcare.[24] The theory of planned behaviour (TPB) was applied as a health psychological model to describe factors relevant for health behaviour and behaviour change, guiding the study planning and development of study materials.[25] By linking a person's beliefs/intentions and behaviour, the TPB is used to explore PwMS's relapse treatment decision making.

The MRC framework provides guidance for planning, designing and conducting process evaluations of complex interventions.[19] Complexity in interventions can (among other things) relate to the number of interacting components, the complexity of the demands on those who deliver the intervention, the number of people targeted by the intervention, the amount and variability of the outcomes and the level of flexibility and adjustment allowed in the intervention.[19] Accordingly, the complexity of an intervention refers to the intervention itself and its implementation process.

MS relapse management in Germany takes place in a complex interplay of evidence, patients and physicians' habits and preferences as well as legal factors, which interact with the study goals. The overall aim of the process evaluation presented in this paper is to understand the functioning of the POWER@MS2 trial and to identify facilitating factors and barriers to the implementation of the intervention programme.

METHODS

This mixed methods process evaluation adresses the POWER@MS2 trial, which comprises the evaluation

of the interactive web-based intervention programme 'ABouts'.[18] The intervention group receives a complex intervention, which consists of the following components:

1. An interactive evidence-based patient information (EBPI) programme including a decision aid in case of an acute relapse. The programme is divided into five modules, which can gradually be accessed over a period of 4 weeks. The EBPI mainly focuses on information about corticosteroid treatment of acute relapses and is supposed to support PwMS in relapse treatment decision making. The programme integrates a multiple-choice test on corticosteroids, which has to be passed to receive a certificate after the webinar.
2. One webinar to facilitate an online exchange with a group of 5–8 PwMS led by a trained MS nurse. After participants have successfully completed the EBPI programme, they are invited to the webinar, which lasts approximately 60 min. The purpose of the webinar is to review the core content of the programme, engage in discussions and clarify any open questions.
3. A protected, supervised online chat room, provided by the DMSG. With the help of the chat, which is available to the participants during the entire duration of the study, participants can exchange information and clarify questions on a long-term basis.

The content and structure of the web-based programme are primarily based on concepts of EBPI and evidence-based medicine.[26 27] PwMS are provided with easily understandable health information based on current best evidence, which is presented transparently.

It is expected that the intervention programme in POWER@MS2 will empower PwMS and facilitate autonomous decision making in relapse management. The intervention programme aims at fewer relapses being treated with corticosteroids and, in case of corticosteroid treatment, less intravenous and more oral therapies.

Participation in the POWER@MS2 trial covers a maximum of 2 years. After inclusion in the study, an initial telephone interview is conducted with the participants at baseline. Data are then obtained in 3 monthly telephone interviews and in paper-based questionnaires. For study inclusion, at baseline and after 12 months, participants have a clinical visit with their treating neurologist (figure 1).[18]

The development and evaluation of a complex intervention entail four different phases: development, feasibility/piloting, evaluation and implementation.[28] As the development phase and the planning of the feasibility/piloting of the POWER@MS2 trial are already outlined in the main study protocol, this protocol focuses on the key element 'evaluation'.[18]

After pointing out the need for guidance on process evaluations in 2010 to assist researchers in developing and conducting process evaluations, the MRC published a framework on process evaluation of complex interventions in 2014.[19 22] The MRC guidance will be used as the theoretical framework to guide this process evaluation applying a mixed methods design.[19] The application

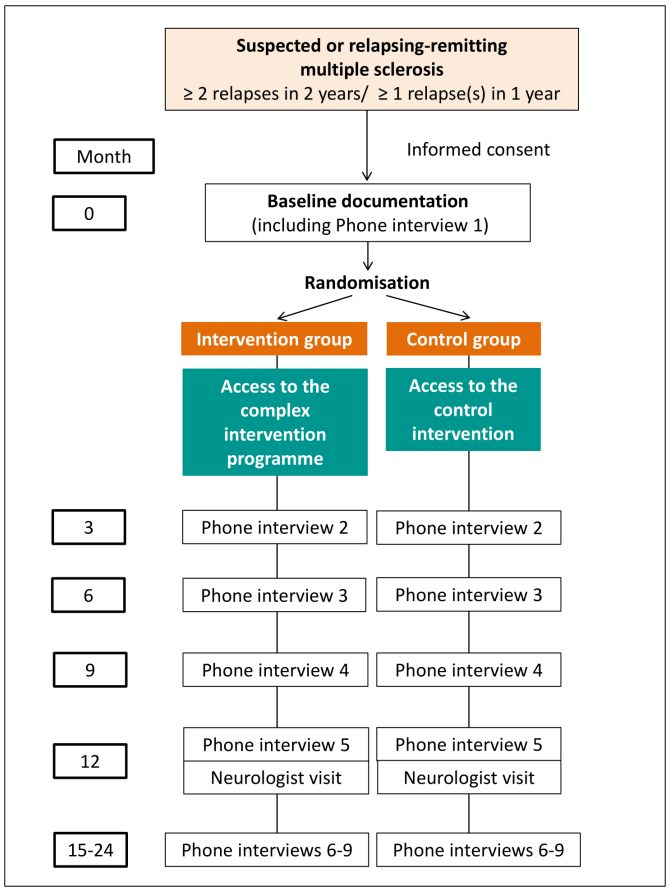

Figure 1 POWER@MS2 study flow. Reproduced with permission from Rahn *et al*.[18]

of the MRC framework to this study, considering the process evaluation framework by Grant *et al*,[29] is shown in table 1. According to the MRC, the evaluation phase consists of three domains, which help to understand the functioning of an intervention: implementation, mechanisms of impact and contextual factors.[19] Furthermore, the framework includes a description of the intervention components and the overall trial outcome and highlights the relationship between the different components. The single components of the framework are set out below and explained in more detail.

The analysis is guided by the following questions:

1. What is the level of implementation of the POWER@MS2 trial?
2. Which factors influenced the implementation process?
3. How did participants (PwMS, clinicians and stakeholders) perceive the intervention programme?
4. What did participants (PwMS, clinicians and stakeholders) think of oral corticosteroid relapse treatment?
5. Which recommendations can be gained to better adapt future interventions or knowledge transfer of the programme?

The detailed research questions, as well the respective assessment methods to achieve this aim, are presented in figure 2.

For this process evaluation, a mixed methods design is applied, using an explanatory sequential design

Table 1 Overview POWER@MS2 process evaluation

Overview process evaluation POWER@MS2				
Domain		**Objects of investigation**	**Assessment/data collection tool**	**Timepoint**
Implementation	Recruitment of centres	Centre recruitment	Information video (about the study), documentation of recruited centres, phone calls or visits to interested centres	Preintervention
		Reason for study participation/for non-participation	Evaluation form (neurologists)	Preintervention and during the intervention
	Delivery to centres	Delivery of information (study management) to neurologists and study nurses (participation, andreach)	Provision of study materials about the intervention programme	Preintervention
	Recruitment of participants	Recruitment of PwMS	Information video (ABouts), newsletter articles, study information poster and leaflets and recruitment (screening lists)	Preintervention
		Reason for study participation/for non-participation	Evaluation form	
	Delivery to participants	Intervention group: delivery of the intervention to individuals (interactive web-based training on relapse management with integrated EBPI and decision aid, nurse-led online exchange and chat)	Provision of access to intervention programme, email reminders, monitoring of programme usage, evaluation forms and interviews	During and postintervention
		Control group: delivery of the control intervention to individuals (standard web-based information on relapse management)	Provision of access to the control programme, email reminders, monitoring of programme usage, evaluation forms and interviews	
Mechanisms of impact	Response of centres	Satisfaction with study procedure (administration and recruitment) and intervention, clinicians' (eg, neurologists' and study nurses') and stakeholders' (opinion leaders') attitude respective the intervention	Evaluation forms and interview	During and postintervention
	Response of participants	Satisfaction with study procedures and intervention, attitude, barriers and facilitators	Evaluation forms and interviews	During and postintervention
	Maintenance	Nurse-led webinar (single trained MS nurse): attitude, acquired routine, barriers, performance during the webinars (online exchange and chat forum) → delivered as intended?	Evaluation forms and interview	Preintervention during and postintervention
		Chat (MS Connect): expert supervising the chat room	Interview	Postintervention
		PwMS: use of the educational programme (web-based training, webinar and chat)	Evaluation forms and interviews	During and postintervention
		PwMS (non-user of the educational programme)	Contacting participants via email or telephone and evaluation form	
	Unintended consequences	Trained MS nurse: Stress, professional relationship to patients and barriers	Evaluation forms and interview	During and postintervention
		PwMS: anxiety, depression, negative impact on disease-specific quality of life and dropout	Questionnaires (secondary outcome measurements) and interviews	
		Neurologists, study nurses: professional relationship to patients and barriers	Evaluation forms and interview	

Continued

Table 1 Continued

Overview process evaluation POWER@MS2			
Domain	**Objects of investigation**	**Assessment/data collection tool**	**Timepoint**
Context	Context factors in Germany (health system) Centre-specific structures and processes	Description Evaluation form	Preintervention
Theory	EBPI, TPB, Empowerment and EBM	Application during study planning and the development of study materials, used in evaluation forms, in the training programme and secondary outcome measurements	Preintervention during and postintervention

EBM, evidence-based medicine; EPBI, evidence-based patient information; PwMS, people with multiple sclerosis; TPB, theory of planned behaviour.

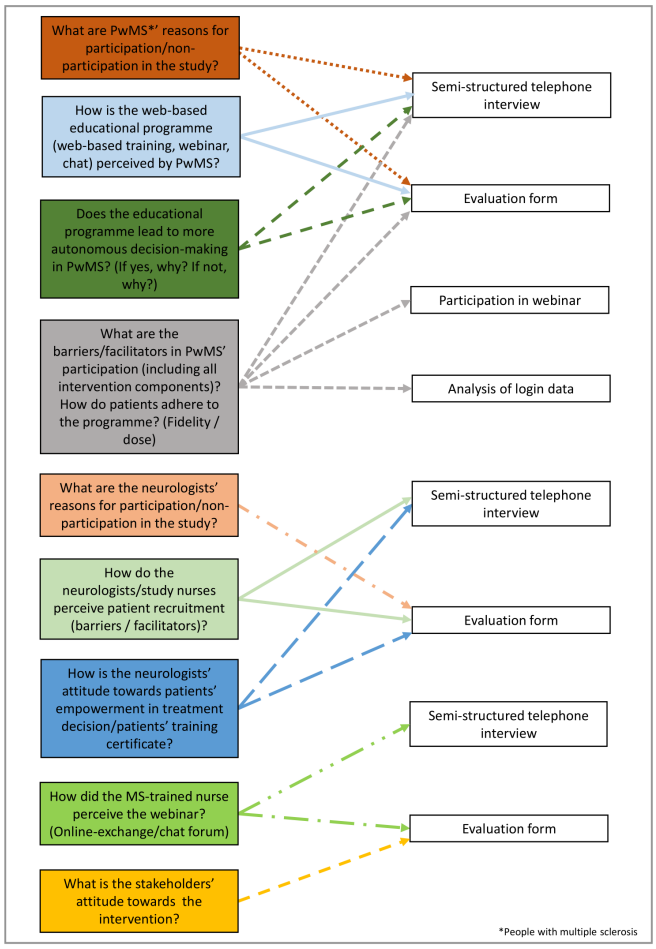

Figure 2 Research questions and assessment methods adopted for the process evaluation of POWER@MS2 (adapted from Moore *et al*)[19]

(figure 3).[30] Qualitative and quantitative data are collected at different time points to explore clinicians' (eg, neurologists, study nurses, trained MS nurse) acceptance of the intervention, use of the web-based programme by study participants as well as the impact of the programme on participants. Written informed consent will be obtained from all study participants and clinicians who are interviewed. The research design includes a two-phase approach. The first phase, which comprises quantitative data collection and analysis, focuses on answering the main research questions of the study. In the POWER@MS2 main trial, quantitative data incorporates standardised questionnaires on primary and secondary study outcomes and evaluation forms informing the process evaluation. The second phase consists of qualitative data collection and analysis.[30] Thus, qualitative data collection and analysis can build on quantitative results and help with interpretation of overall results. Concerning the POWER@MS2 study, qualitative data collection includes semistructured telephone interviews, which take place at the end of the study (figure 3).

Table 2 provides an overview of the categories of participants included in the quantitative data collection of

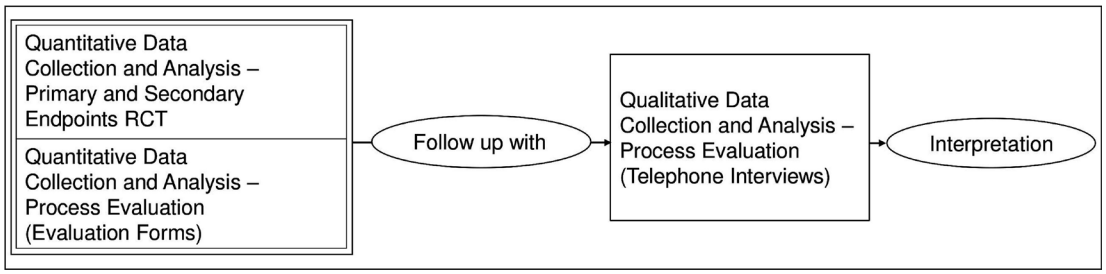

Figure 3 The explanatory sequential research design in POWER@MS2 (adapted from Creswell and Plano Clark)[30]. RCT, randomised controlled trial.

this process evaluation and the corresponding measurement time points. The process evaluation will start with the recruitment of study centres as well as the discussion of context-specific requirements with stakeholders and opinion leaders. The evaluation forms used for this process evaluation are orientated on already existing forms that had been developed and successfully implemented in other complex interventions.[31] The evaluation forms were adapted and further developed for this study and include closed-ended and open-ended questions about the respective programme, satisfaction with the programme and the POWER@MS2 trial itself, time and effort spent on the study and suggestions for improvement.

Patient involvement

Patients were involved in the design and implementation of this project from the very beginning. The DMSG is a central member of the study team including members of the patient representative council. Patient representatives were involved in discussions and decisions regarding planning and implementation of the POWER@MS2 trial including this process evaluation. Furthermore, the coauthors and patient representatives JS and MvdL were involved in planning and revising this process evaluation.

Data collection

Implementation

Evaluating the implementation of an intervention by assessing the fidelity, dose and reach enables tailoring and replicating interventions to different contexts.[20] Furthermore, the key function 'implementation' can help to provide information about how an intervention is conducted.

Recruitment of centres

As participants are enrolled through various external study centres and neurological practices, the process evaluation focuses on the recruitment of centres (table 1, recruitment of centres). Private neurological practices

Table 2 Process evaluation timeline POWER@MS2

Category of participants	Measurement time points										
	Screening	Baseline									
	v_{-1}	v_0	v_1	v_2	v_3	v_4	v_5	v_6	v_7	v_8	v_x
Month	**–1**	**0**	**3**	**6**	**9**	**12**	**15**	**18**	**21**	**24**	**X**
Non-participation study centres	×										
Centres structures/ processes	×										
Evaluation neurologists		×		×				×			
Evaluation study nurses				×				×			
Evaluation trained MS nurse				×				×			
Non-participation PwMS	×	(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)
Evaluation PwMS		×	×			×				×	×
Evaluation dropouts		(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)	(×)
Evaluation stakeholders		×									

(×), optional visits; MS, multiple sclerosis; PwMS, people with multiple sclerosis; v_0, visit directly after enrolment; v_{-1}, visit before enrolment; v_1, visit in month 3; v_2, visit in month 6; v_3, visit in month 9; v_4, visit in month 12; v_5, visit in month 15; v_6, visit in month 18; v_7, visit in month 21; v_8, visit in month 24; v_x, visit after the final participant reaches v_4 (all participants, who have not reached v_8).

and MS outpatient departments of academic and community hospitals throughout Germany are contacted by email (preintervention). The email contains information about the study and includes a link to an information video on POWER@MS2. In the video, members of the coordinating study team and patient representatives provide general information about the study and the intervention programme. In case of non-participation, study centres are asked to fill out a separate non-participation questionnaire and explain their reasons (table 2). Interested centres are contacted by phone. If required, the study team also visits individual centres to further discuss the study and establish trial fidelity. Centres that agree to participate in the study are listed separately and displayed as study centres on the DMSG website. To investigate the reason for participation, semistandardised evaluation forms are completed by the neurologists at baseline, after 6 and after 18 months (table 2).

Delivery to centres

All participating centres receive printed study materials in advance, including worksheets for medical visits, process evaluation sheets, leaflets on POWER@MS2 and other materials relevant for participating in the trial to facilitate and maintain participation (table 1, delivery to centres). The study team conducts an online study initiation with each centre before centres start recruiting patients. All neurologists and study nurses of the respective centres involved in the POWER@MS2 trial have to participate in the initiation. In addition to the presentation of the study's scope, goal and objectives, roles and responsibilities within the trial, communication between the MS centre and the coordinating centre and study documentation are discussed in detail.

Recruitment of participants

To increase awareness and recruiting potential study participants, the study is advertised in several ways (table 1, recruitment of participants). The DMSG maintains a website that provides useful information on the POWER@MS2 trial (https://www.dmsg.de/power@ms). The website informs PwMS about the web-based programme provided within the POWER@MS2 trial, the objectives of the study, eligibility criteria and participating centres. PwMS also receive access to an information video on POWER@MS2. Provision of the contact address in the video and on the website allows PwMS to contact the coordinating centre for additional information. To further support patient recruitment, study information is published in newsletters of various regional associations of the DMSG and newsletters of other project partners. Patient leaflets are printed and distributed in the participating MS centres. PwMS, who meet the inclusion criteria but decide not to participate in the study, are asked to fill out a non-participation form, which will be forwarded to the study team (table 2). Concerning PwMS who want to participate in the trial but do not meet the inclusion criteria, neurologists of all participating MS centres are asked to fill out a screening form and send it anonymously to the coordinating centre.

Delivery to participants

Usage of the intervention and control programme is regularly monitored (table 1, delivery to participants). Every fortnight, the central study nurse of the coordinating centre receives a notification of the user activity of all participants. The number of all log-ins in the web-based programme, as well as the log-ins of the last 4 weeks, are monitored. Participants who have not been active for 2 weeks will be contacted by email or telephone. All users of the intervention and control programme also receive regular automatic reminders to encourage the use of the programmes. In the intervention group, the knowledge gained through the programme is tested in a quiz as well as in a standardised questionnaire during the course of the study.[18] As described previously, the intervention programme also includes a webinar and an online chat. To encourage participation in the webinar, different dates will be offered to the participants. The use of the chat is monitored at least once a week by experts (patient representative and members of the coordinating study team comprising of clinicians, MS experts and health scientists), who can answer open questions and stimulate discussions among the participants. Evaluation forms and telephone interviews are used to evaluate how often the chat was used by the participants and whether it was helpful. In the course of the study, evaluation forms on the process evaluation are completed by the participants (at baseline, after 3 and 12 months and at the end of the study) (table 2). Furthermore, qualitative semistandardised telephone interviews with individual participants take place after completion of the study. We aim to interview at least 10–20 minimum and maximum users of the intervention, variated in gender.

Mechanisms of impact

Mechanisms of impact intend to help understand through which mechanisms the intervention produces change.[19 20] Participants' responses to and interactions with the intervention have to be examined to understand how the intervention works. Furthermore, it is also important to assess whether induced changes are intended and consistent. Accordingly, this part of the process evaluation also focuses on determining the unintended and unexpected pathways and consequences thereof.

Response of centres

Since participating neurologists' and study nurses' attitudes about and commitment to the intervention are considered as an important factor in the implementation process of POWER@MS2, the process evaluation focuses among other things on the assessment of the clinicians' views (table 1, response of centres). It is explored whether the trial is implementable, accepted and supported by the MS centres and whether there are any changes made to it during the study. Quantitative semistandardised

evaluation forms are completed at three time points (neurologists), at two time points (trained MS nurse, who conducts the webinars in the intervention group and study nurses) and at one time point (stakeholders/opinion leaders in the field of MS who have been involved in designing the trial) (table 2).

Maintenance

Furthermore, it is evaluated whether the webinar and the chatroom are feasible and helpful (table 1, maintenance). In addition to the evaluation during the study, neurologists and other health professionals in the centres working with the patients, the trained MS nurse and the expert supervising the chat room will be interviewed via telephone by members of the coordinating centre after study termination. Telephone interviews will be conducted as soon as the quantitative analysis of the study results is completed.

Response of participants

Apart from examining the centres' response to the intervention, the process evaluation also focuses on the investigation of the response of PwMS to the intervention (table 1, response of participants). It is explored whether the programme is understandable, user-friendly and accepted. Semistandardised evaluation forms including open-ended questions are completed by the intervention and control group at four different time-points (table 2). To be able to address the different components of the intervention programme (EBPI programme, webinar and chat), both groups receive different evaluation forms. After study completion, semistandardised telephone interviews will be conducted (see previous). The interviews take place after the analysis of the questionnaires and evaluation forms, to go into more detail about the facilitating and inhibiting factors of the intervention.

Unintended consequences

The intervention can have positive but possibly also negative effects on PwMS and clinicians (eg, neurologists, study nurses and trained MS nurse) (table 1, unintended consequences). Concerning PwMS, anxiety, depression and quality of life are measured as control parameters in the RCT using standardised questionnaires.[18] For various reasons, PwMS may terminate the study prematurely. In that case, the study nurse of the coordinating centre will try to contact the participant concerned by telephone. An evaluation form will be used to assess the reasons that led to the discontinuation of the study (table 2, unintended consequences).

Context

Investigating the effect of all external factors, which might act as barriers or facilitators to the implementation of an intervention, is part of the component context.[19 20] Contextual factors might also affect mechanisms of impact and the outcomes of an intervention or vice versa. The investigation of contextual factors is a prerequisite for understanding why interventions work or do not work and to explain to what extent we expect other effects when interventions are carried out in different contexts.[22]

To understand the context in which POWER@MS2 is implemented, all centres complete a centre qualification form before participating in the trial that is used to survey centre-specific structures and processes (table 2, context). With the evaluation form, general characteristics as well as MS-specific structures and processes can be assessed (eg, annual number of patients, the annual number of patients with relapsing-remitting MS and number of employees). Relapse management attitudes in MS are influenced by very different parties within the health system, for example, patients, neurologists, the German MS Competence Network, general physicians, patient initiatives, the DMSG as well as health and rent insurance companies.[9] Treatment affects practices, acute care hospitals as well as rehabilitation clinics. As only an intravenous high dose (1000 mg) methylprednisolone application is approved in Germany, oral treatment is also associated with the dilemma of off-label treatment resulting in having to take 25 40 mg methylprednisolone tablets or having a pharmacy prepare a prednisolone solution, while methylprednisolone is not available for an individual's prescription. Finally, some centres also allow patients to drink methylprednisolone solution licenced for intravenous application. Bioavailability is regarded as not much different, thus justifying this approach.[32] In the medicolegal grey area, risk attitudes of neurologists might differ considerably. The process evaluation of POWER@MS2 aims to better understand the views of all the parties on these facts. The POWER@MS2 trial is conducted in 20 MS centres and neurological practices throughout Germany. Depending on whether a small neurological practice from the surrounding area or a university or community-based hospital with an MS outpatient clinic participates in the trial, these figures can vary considerably. As a result, the number of potential study participants can also vary between centres. In addition to the baseline evaluation form, qualitative interviews will be conducted with participating neurologists and study nurses at the end of the trial. In the interviews, the contextual factors that may have impeded or strengthened the implementation process can be discussed in more detail.

ANALYSIS

Data from the trial and the process evaluation are first analysed separately. Together with the analysis of the primary and secondary endpoints of the RCT, the quantitative analysis of the process evaluation forms is carried out. Afterwards, the results of the trial and process evaluation data are combined and, based on the results, qualitative interviews are conducted and analysed. Quantitative data extracted from the questionnaires and evaluation forms will be analysed descriptively using IBM (International Business Machines Corporation) SPSS Statistics 26.0. Subgroup analyses will be performed to compare different groups of participants, for example, minimum

and maximum users of the intervention/control programme and participants not treated or treated with oral corticosteroids and participants receiving intravenous therapy. Furthermore, the impact of the intervention on these groups will be assessed. Qualitative data obtained from the interviews will be analysed thematically according to Braun and Clarke.[33] The data will be coded thematically with the software MAXQDA 2020 (VERBI Software, 2019). Besides coding, this process includes creating categories and abstraction from themes to establish a link between the dataset and the research question.[33] This analysis approach allows for large amounts of data to be reduced to concepts that describe the research phenomenon. The results of this mixed methods approach will be merged in a joint display table.[30] This will provide a visual integration of the quantitative and qualitative data to identify complementary information in the datasets and gain a deeper understanding of the data. MAXQDA software will be used to combine both types of data and represent the results.

DISCUSSION

Following the MRC framework, this process evaluation aims to give a comprehensive insight into the implementation, the mechanisms of impact and the contextual factors influencing the underlying trial POWER@MS2. The process evaluation explores the potential substantial structural change in relapse management for PwMS introduced by the intervention, for example, oral corticosteroid relapse treatment. It will help to better understand the attitudes of parties within the health system on the complex issue of relapse management from decisions on treatments in general to setting and route of application. An earlier study, investigating the implementation of an EBPI and group training programme on relapse management into clinical practice, confirmed transferability of the programme and indicated that it enhances autonomous relapse treatment decision making in PwMS.[34] The POWER@MS2 trial builds on these findings and uses the accompanying mixed methods process evaluation presented here for a subsequent and successful implementation of the intervention. By using an explanatory sequential mixed methods research design, the qualitative results can help with the interpretation of the quantitative results. This will support understanding of how and why the implementation of the intervention worked and produced specific outcomes. Furthermore, possible barriers and facilitators of implementation can be identified and used to inform practitioners for planning future interventions and for knowledge translation of POWER@MS2. This knowledge and the thoroughly developed mixed methods process evaluation can help to better adapt future interventions to similar contexts, for example, relapse management in rheumatic diseases or chronic infectious diseases, and to achieve the intended objectives.

ETHICS AND DISSEMINATION

Ethical approval for the POWER@MS2 trial and the process evaluation has been obtained from the Ethical Committee of the University of Lübeck (reference 19–024).

The results of the process evaluation, as well as the overall study results, will be disseminated in relevant journals, at conferences, meetings (eg, at the yearly congress of the German Society of Neurology) and on the DMSG website and other relevant patient websites.

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