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Development of Enhanced Reviews of Psychological Changes After Stroke (ENRICH): A complex Intervention to Monitor and Support Self-Management of Post-Stroke Psychological Changes Within a Matched Care Model

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Abstract

Objective: To report the design and development of a complex intervention to monitor and support self-management of post-stroke psychological changes.

Design: The Medical Research Council framework for complex intervention research guided development work, which included a literature review, semi-structured interviews with stroke survivors ($n = 26$) and family members ($n = 11$), a Delphi survey with healthcare professionals and researchers ($n = 42$), and workshops with stroke survivors ($n = 4$), family members ($n = 3$), and healthcare professionals ($n = 5$).

Setting: Stroke community care.

Participants: Stroke survivors, family members, healthcare professionals and researchers.

Intervention: The Enhanced Reviews of Psychological Changes after stroke (ENRICH) programme is a brief intervention deliverable within the UK matched care model of post-stroke psychological support. It supports stroke survivors with mild to moderate cognitive changes, low mood, anxiety and fatigue by monitoring symptoms, providing personalised psychoeducation, and supporting self-management through three brief reviews at 1, 3, and 6 months. Those with more severe or persistent psychological changes are referred through local care pathways for specialist psychological input.

Main measures: The intervention is reported using the TIDieR checklist.

Results: The logic model and programme theory suggest benefits for psychological wellbeing and quality of life, with stakeholder input likely to enhance acceptability and feasibility.

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Conclusions: ENRICH has the potential to address gaps in UK post-stroke care for those with mild to moderate changes affecting cognition, mood, anxiety and fatigue when delivered within the matched care model. Feasibility testing is underway with future clinical effectiveness testing is planned.

Keywords
Cognitive impairment, stroke, psychological factors, patient-centred care, rehabilitation interventions

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Introduction

Both the National Stroke Service Model and Integrated Community Stroke Service Model have highlighted the need to improve post-stroke psychological care in the UK.[1,2] Similarly, a recent James Lind Alliance priority-setting exercise identified post-stroke mental health, emotional problems and cognition as the top research priorities for improving stroke outcomes.[3,4] This emphasis on supporting post-stroke psychological changes reflects their high prevalence,[5–7] substantial impact on activities of daily living and quality of life,[8–10] and significance to stroke survivors who consistently identify psychological changes as their most important unmet care need.[11–13]

Current UK clinical guidelines recommend a matched care model comprising three levels for supporting post-stroke psychological changes with the type and intensity of care tailored to individuals' needs, preferences and circumstances.[14–16] Level 1 care for mild, transient post-stroke psychological changes includes routine assessment of cognition and mood, with possible brief interventions (e.g., motivational interviewing, compensatory strategies).[14,16] Level 2 for moderate psychological difficulties should involve brief protocolised psychological interventions (e.g., behavioural activation, cognitive behavioural therapy).[14,16] Level 3 for severe or persistent psychological difficulties includes tailored psychological interventions from specialist clinicians (e.g., clinical psychologists, clinical neuropsychologists, speech and language therapists).

However, provision of post-stroke psychological care falls well below guideline standards because of complex, systemic barriers. First, the stroke care pathway is fragmented and geographically heterogeneous with very limited specialist clinicians available. While Integrated Stroke Delivery Networks (ISDNs) aim to address fragmentation and heterogeneity,[1] there is an ongoing need to increase the psychological workforce within these networks given the guideline standards for timely access to post-stroke psychological support.[17,18] Second, there is limited high-quality evidence to support the effectiveness of interventions for post-stroke cognitive changes,[19–23] which creates uncertainty among clinicians and limits allocation of clinical resources to this important area.

The Enhanced Reviews of Psychological Changes after stroke (ENRICH) research programme was established to develop and evaluate a complex intervention for mild to moderate post-stroke psychological changes in cognition, mood, anxiety, and fatigue in line with guidelines. The programme is guided by the Medical Research Council (MRC) framework for complex intervention research, which comprises four iterative stages: intervention development, feasibility testing, evaluation, and implementation.[24] This paper summarises the development of the ENRICH intervention. First, the development process is reported in accordance with MRC recommendations.[24,25] The resulting intervention is then described using the Template for Intervention Description and Replication (TIDieR) checklist.[26]

Methods

Three iterative research activities were conducted to develop the ENRICH intervention: establishing the

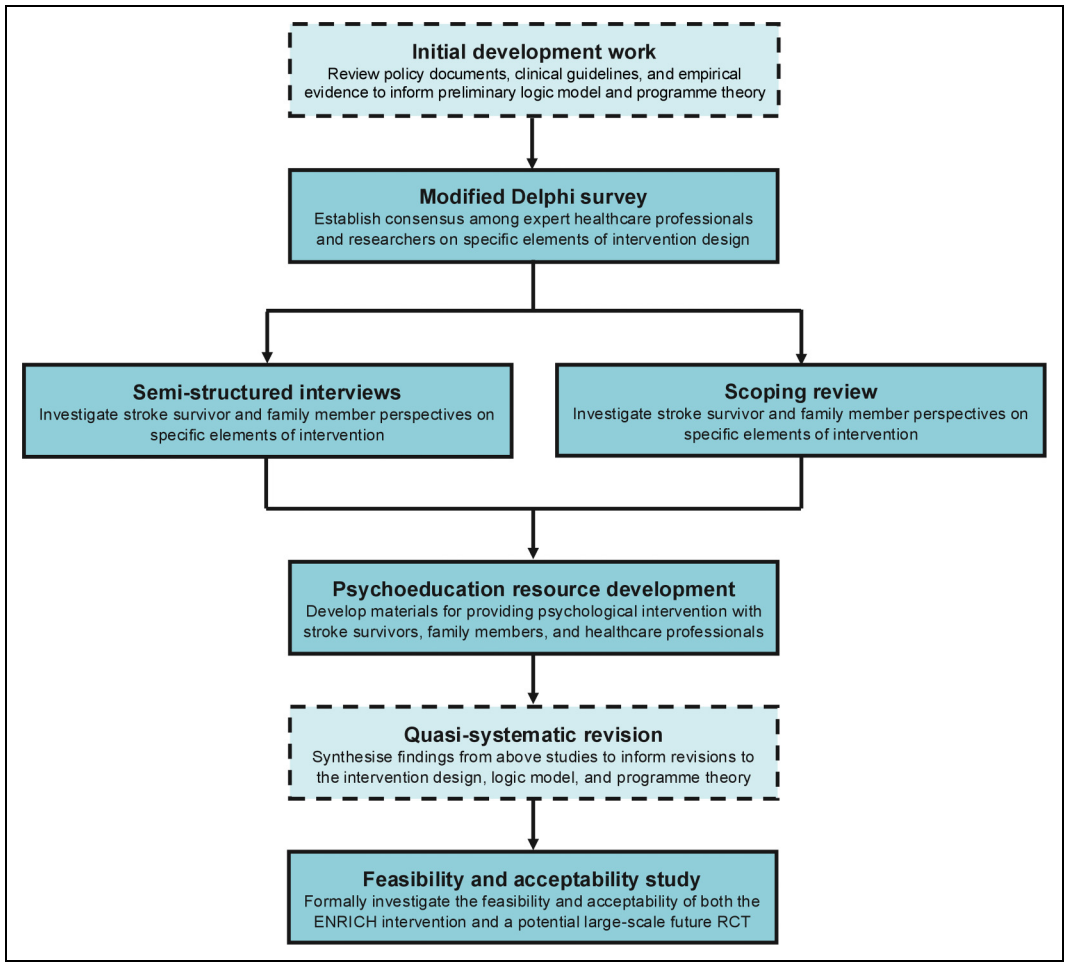


Figure 1. Flow diagram summarising the research activities conducted to develop the ENRICH intervention. Dark blue boxes denote activities that prioritised stakeholder involvement. Light blue boxes indicate activities conducted by the research team with post hoc consultative input from stakeholders to finalise the results on conclusions.

evidence base, identifying relevant theory, and modelling process and outcomes.[24,25] These are summarised in Figure 1 with full details reported below.

Establishing the Evidence

Intervention development began with a targeted review of key policy documents, clinical guidelines and published evidence. Clinical guidelines were used to identify the minimum requirements for a post-stroke psychological intervention for people with mild to moderate changes that would be aligned with recommended standards,[14,15] while policy documents clarified the clinical context of delivery.[1,2,27] Peer-reviewed empirical evidence informed more specific design decisions (e.g., screening measures,[28–31] additional intervention components,[19–23,32,33] feasibility and effectiveness of previous interventions targeting mild post-stroke psychological changes[34–39]). A targeted review was undertaken because the breadth of questions addressed at this stage was not suited to a systematic review of a single research question.

Identifying Theory

While multiple theoretical perspectives informed intervention development, the Y-shaped process model of neuropsychological rehabilitation was the primary influence.[40] Grounded in principles of cognitive behavioural therapy, the model proposes positive adjustment after stroke reflects both functional recovery and/or adaptation to ongoing difficulties. The model informed the intervention and programme theory by identifying potential mechanisms of change and likely outcomes.

Prioritising Stakeholder Input

Stakeholder involvement was prioritised given evidence it improves intervention quality, relevance, and uptake[41–44] and in line with MRC recommendations.[24,25] Following initial review of policy documents, clinical guidelines, and published evidence, remaining uncertainties were translated into research objectives addressed through five linked empirical studies. Full details of their methods, samples, and findings have been published elsewhere.[45–48] Briefly, these studies included a modified Delphi survey of healthcare professionals ($n = 32$) and stroke researchers ($n = 10$),[46] a scoping review,[48] semi-structured interviews with stroke survivors ($n = 26$) and family members ($n = 11$),[45,47] and workshops involving stroke survivors ($n = 4$), family members ($n = 3$), and healthcare professionals ($n = 5$). Stroke survivors had diverse neuropsychological profiles (e.g., aphasia, visuospatial neglect, memory difficulties, low mood, anxiety and fatigue) and healthcare professionals represented various disciplines (e.g., medicine, clinical psychology, nursing, occupational therapy and speech and language therapy).

Modelling Processes and Outcomes

A preliminary logic model, programme theory, and intervention were developed prior to commencing the above research activities. The logic model at this stage provided a basic outline of the problem, intervention, and outcome given recommendations to use simple models early in complex intervention development to avoid obfuscating key principles, as this could constrain later development.[49]

The model, programme theory, and intervention were iteratively refined throughout the five empirical studies, then formally revised following their completion using a quasi-systematic approach.[50,51] This involved translating key findings into discrete evidence statements, which informed candidate intervention requirements (evidence-based, concrete and actionable features). These requirements were assessed against three criteria: relevance to target outcomes, feasibility of implementation in the project scope, and feasibility of implementation in clinical practice. Requirements meeting all three criteria were retained, while those meeting one or two were adapted or rejected.

This process resulted in a set of intervention requirements that informed the final intervention, logic model and programme theory. These were reviewed by the Patient and Public Involvement (PPI) group, which included five stroke survivors and three family members, and the study advisory group. Final revisions were made based on feedback, and readiness for feasibility and acceptability testing was agreed at this stage.

Results

The final ENRICH intervention (Figure 2) is reported below using the TiDier checklist and summarised in Table 1. Figure 3 illustrates the logic model.

Name. Enhanced Reviews of Psychological Changes after stroke (ENRICH).

Why. The ENRICH intervention was developed to support mild to moderate post-stroke psychological changes (cognitive impairment, low mood, anxiety and fatigue), which are highly prevalent[5–7] and impactful[8–10] but under supported within the UK stroke care pathway at present.[11–13,52] Designed for delivery within a matched care model, it aims to improve consistency of care nationally and continuity of care for individual stroke survivors. Its delivery by allied health professionals offers a

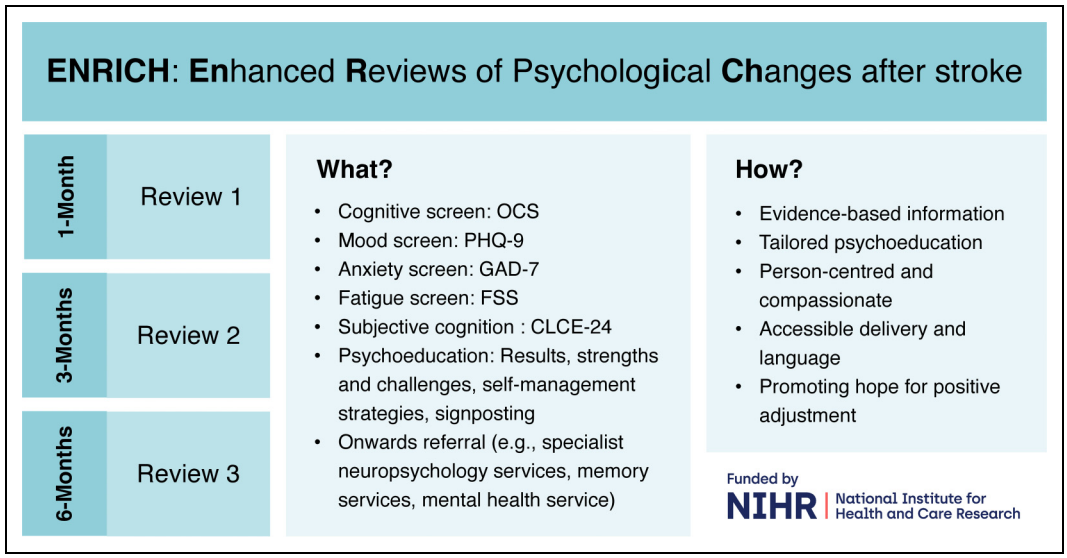


Figure 2. Summary of ENRICH intervention.

pragmatic approach for supporting those with mild to moderate psychological changes given clinical psychologists and neuropsychologists are currently a scarce commodity within stroke services with an urgent need for additional provision.[17]

The focus on screening, tailored psychoeducation and supported self-management aims to support stroke survivors to understand and develop skills to manage and minimise the impact of mild to moderate psychological changes on activities of daily living and other domains of rehabilitation. Monitoring across three timepoints ensures those with persistent and highly impactful psychological needs are identified and receive timely referral for more specialist input.

What. ENRICH comprises three reviews of cognition, mood, anxiety and fatigue with stroke survivors and a family member/friend if preferred at one-, three-, and six-months post-stroke. Each review includes screening with validated tools that meet recommended standards,[14,31,53] tailored psychoeducation and supported self-management using a semi-structured workbook co-developed with stakeholders, and signposting or referral.

Screening measures were selected by stakeholders from a range of alternatives based on acceptability and feasibility. The screening tools are: Checklist for Cognitive and Emotional Consequences following stroke (CLCE-24),[54] Oxford Cognitive Screen (OCS),[30] Patient Health Questionnaire (PHQ-9)[55] Generalised Anxiety Disorder Questionnaire (GAD-7)[56] and Fatigue Severity Scale (FSS).[57] Any risk concerns identified during screening are escalated in accordance with local clinical protocols with supervision, ideally from clinical psychologists and neuropsychologists, to support decision-making.

The semi-structured workbook for providing personalised psychoeducation and supported self-management was developed with input from stroke survivors with diverse neuropsychological profiles (e.g., aphasia, memory difficulties, low mood), family members, and healthcare professionals from various disciplines (e.g., occupational therapy, clinical psychology, speech and language therapy). Development methods and participant demographics are fully detailed in the Supplementary Materials. Stroke survivors receive a hard copy of the workbook at the first review and retain it for future reference and reviews, with replacements provided if required. The workbook includes an overview of post-stroke psychological changes, structured records of functioning

Table 1. Summary of the ENRICH intervention.

TIDieR category	Intervention description
Name	• Enhanced Reviews of Psychological Changes after stroke (ENRICH)
Why	• Brief intervention for mild to moderate changes in cognition, mood, anxiety, and fatigue after stroke. • Screening supports identification and timely onwards referral for psychological changes requiring different levels of support within the matched care model. • Personalised psychoeducation and compensatory strategies support self-management of and positive psychological adjustment to post-stroke psychological changes.
What	• Three brief reviews of psychological changes at one, three, and six-months after stroke. • Screening with standardised measures: CLCE-24, OCS, PHQ-9, GAD-7, FSS. • Personalised psychoeducation and self-management support with a co-developed semi-structured workbook. • Risk management and referral in accordance with local service protocols.
Who provides	• ISDNs provide the intervention as part of the matched psychological care provision alongside existing psychological support available. • Trained non-psychology allied health professionals deliver reviews with clinical supervision and clinical psychology oversight.
How	• Screening, risk management, and referral follow standardised and local protocols. • Psychoeducation and supported self-management use a semi-structured approach to deliver core and personally relevant content. • The intervention takes a person-centred approach.
Where	• Reviews are conducted at home with stroke survivors to support holistic assessment and promote accessibility.
When and how much	• Three reviews are delivered at one, three, and six-months post-stroke reflecting stakeholder preferences for sustained rather than single contact input. • Each review lasts approximately one-hour inclusive of breaks.
Tailoring	• Reviews provide both core information on post-stroke psychological changes, and tailored personally relevant feedback (strengths and challenges) and self-management strategies.
Modifications	• Intervention modifications will be made following feasibility and acceptability testing, which is currently underway across three UK stroke care pathways.
How well	• Adherence is supported by ongoing clinical supervision. • The current feasibility study will assess fidelity using structured checklists and audio recordings from a subset of reviews.

for cognition, mood, anxiety, and fatigue (including strengths and challenges) to support monitoring and trajectory mapping, tailored self-management strategies, and signposting to community services and resources. Sample pages are provided in Supplementary Materials with plans to make the full workbook openly available on completion of evaluation research.

Who Provides. ENRICH is provided by non-psychology allied health professionals with clinical supervision following training. In the current feasibility study, there is a four-hour interactive in-person training session led by the study team and a stroke survivor. Training combines didactic teaching with practical skill development, including scoring and interpretation of screening measures, use of the workbook, and delivery of tailored psychoeducation. Ongoing clinical supervision is provided within existing service structures, with recommendations for oversight by a qualified clinical psychologist. Within the feasibility study, additional research supervision is provided by the study team.

At a service level, ENRICH should ideally be delivered by clinicians within ISDNs. As these

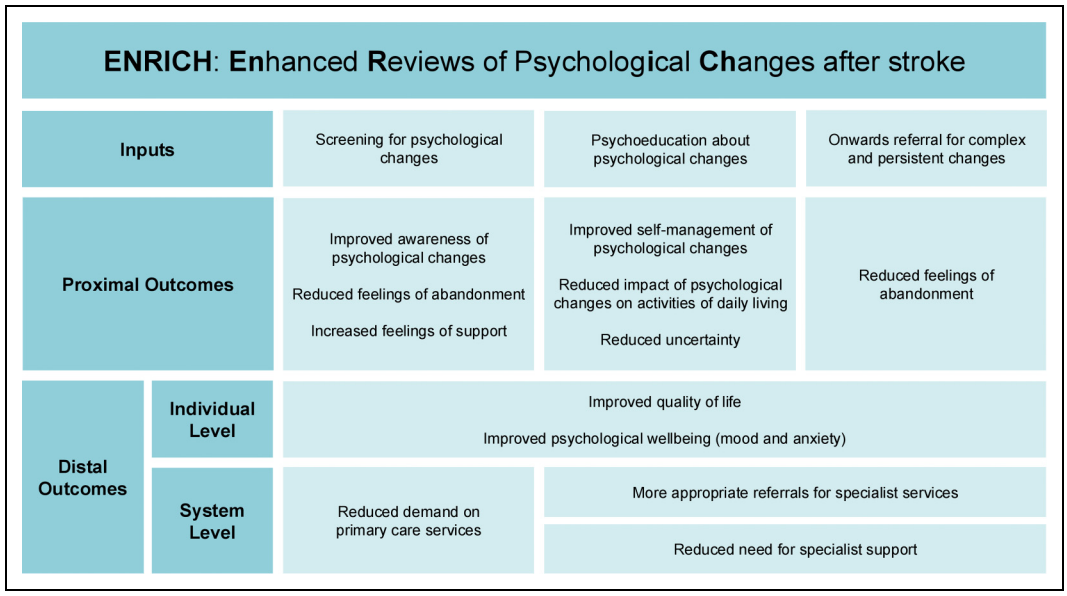


Figure 3. Logic model summarising ENRICH intervention components, mechanisms of change, and expected outcomes.

networks have not been widely and consistently established, the intervention is being delivered across heterogenous care pathways within the current feasibility study. There will be an evaluation of feasibility to deliver the intervention across multiple services.[58]

How. The intervention is underpinned by a person-centred approach that prioritises consistent delivery of accessible, compassionate care. While standardised protocols for screening measures and local protocols for risk management and referral are used to ensure consistency and quality, psychoeducation involves delivery of core content alongside tailored feedback (strengths and challenges) and personally relevant self-management strategies to promote person-centred compassionate care.

Where. Reviews are conducted in person at home to support a holistic assessment of psychological wellbeing and functioning, and to promote accessibility.

When and how much. Each review lasts approximately 1-hour with allowance for breaks, which was found to be acceptable during pilot work. Three reviews are delivered as stakeholders consistently expressed a preference for sustained rather than single contact input.

Tailoring. The intervention prioritises delivery of standardised components in line with protocols (screening measures, risk management and referral) and delivery of basic information about post-stroke psychological changes and recovery to all stroke survivors. More tailored information about individuals' strengths and challenges, and personally relevant strategies to manage these changes are then identified. Clinical and research supervision will support joint prioritisation of standardisation and tailoring.

Modifications. Feasibility and acceptability testing is underway across three UK stroke care pathways (April 2025 and October 2026). Further intervention modifications will be informed by quantitative and qualitative data on acceptability and feasibility (intervention uptake, completion, delivery competence, and fidelity). Modifications will be agreed

in consultation with the PPI panel and study advisory committee. Findings will inform a planned multisite cluster randomised controlled trial of clinical and cost effectiveness. Full details of the feasibility study methods are reported elsewhere.[58,59]

How Well

Ongoing supervision will support adherence to the intervention protocol. Formal assessment of fidelity is conducted within the feasibility study through evaluation of structured checklists completed by healthcare professionals after each ENRICH review, and audio recordings of a subset of ENRICH reviews where optional participant consent was provided.

Discussion

This paper summarised the development of a complex intervention for mild to moderate post-stroke psychological changes (cognition, low mood, anxiety and fatigue) to be delivered within the UK matched care model for psychological support. The intervention addresses current gaps in post-stroke psychological care identified within national audits,[52,58] systematic reviews[11–13] and priority setting exercises[4] by providing a framework for screening, monitoring, and supporting self-management of psychological changes through delivery of three brief reviews. Feasibility testing of both intervention delivery and a future randomised controlled effectiveness trial is currently underway across three UK stroke care pathways.[58,59]

The intervention bears similarities to other post-stroke psychological interventions that have been subject to feasibility or clinical effectiveness testing, while differing in several important respects. First, while the StrokeCog intervention shares an emphasis on psychological rehabilitation following stroke, it is positioned at a different level within the matched care model, targeting more severe psychological difficulties through an intensive, neuropsychologist-led group programme comprising five weekly 2.5-h sessions.[34,35] Second, the Extended Stroke Rehabilitation Service (EXTRAS) provided structured post-stroke reviews of rehabilitation needs, advice, signposting, and onward referral, but it targeted a broader range of rehabilitation needs beyond psychological changes. Although a randomised controlled effectiveness trial of EXTRAS did not demonstrate improvements in the primary outcome of extended activities of daily living, secondary findings suggested the low-intensity structured review – which bears some resemblance to those offered within ENRICH – may confer benefits for mood and anxiety.[38,39] Finally, the ECO-Stroke intervention involves a single session focused on screening and self-management support for cognitive, emotional, and participation difficulties.[36] While this approach is arguably most similar to ENRICH, the current intervention differs in its provision of ongoing input over three reviews, which was consistently preferred over a single contact by stakeholders during development work. A recent feasibility study indicated ECO-Stroke is feasible to deliver in routine practice,[60] though its evaluation within the Dutch healthcare system may limit the transferability of findings to a UK setting.

A key strength of the ENRICH intervention is its systematic development using the MRC complex intervention research framework,[24,25] which is likely to enhance its feasibility, acceptability, and future uptake in clinical stroke care contexts. A further advantage of this work is the use of structured reporting frameworks, including the TIDieR checklist[26] and MRC stages of intervention development.[24,25] Transparent reporting is widely recognised as essential for enabling replication, evaluation, and implementation across diverse contexts,[24,61–63] yet systematic reviews suggest reporting quality for complex interventions remains inconsistent.[64]

Some limitations of the intervention development work should be acknowledged. First, the Y-shaped process model of neuropsychological rehabilitation[40] strongly informed the intervention design and programme theory but was not applied in a systematic manner, reflecting the broad challenge in complex intervention research that theory is often loosely applied.[65] Second, heterogeneity of stroke care provision, including variation in service structures, care pathways, and access to

specialist expertise, meant aspects of the intervention could not be uniformly specified (e.g., referral criteria for more specialist psychological input at Level 2 and Level 3, risk management and escalation). The ongoing feasibility study will examine how ENRICH interfaces with existing provisions, protocols, and pathways across different service configurations. Finally, stroke survivor participants were drawn from an existing volunteer database linked to two Oxfordshire services, which limits the diversity of perspectives represented due to the majority White British, highly educated demographic of the area. The ongoing feasibility study aims to recruit a more diverse and much larger sample from three UK settings to provide additional qualitative data on acceptability, which will be incorporated in the ENRICH intervention before planned trials to determine efficacy.

In conclusion, this paper provides a comprehensive and transparent account of the development of ENRICH, a complex intervention delivering post-stroke psychological care through three reviews of cognition, mood, anxiety, and fatigue to support those with mild to moderate changes as part of the recommended matched care model. This reporting will support robust evaluation of feasibility and effectiveness in ongoing and planned future research.

Clinical Messages

- The ENRICH intervention provides support to stroke survivors with mild to moderate changes affecting cognition, mood, anxiety and fatigue, which are highly prevalent and impactful but currently under supported within the UK stroke care pathway.
- Clinical guidelines, policy documents and existing empirical evidence were thoroughly reviewed, and five additional empirical studies conducted, to develop an intervention that is firmly grounded in evidence, theory, and stakeholder preferences.
- Acceptability and feasibility of the ENRICH intervention was enhanced by prioritising involvement of stroke survivors, family members, and healthcare professionals throughout the development work.

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Ethical Approval and Informed Consent Statements

Ethics approval was granted by the University of Oxford Medical Sciences Interdivisional Research Ethics Committee (MS IDREC) for the Delphi survey of expert healthcare professionals and stroke researchers (Ethics Approval Reference: R76686/RE001) and semi-structured interviews with stroke survivors and family members (Ethics Approval Reference: R80681/RE001). The University of Oxford Medical Sciences Interdivisional Research Ethics Committee reviewed the study protocol and participant-facing materials for co-development workshops to develop the psychoeducation resources and determined the project did not require ethical approval. Best-practice ethical conduct was adhered to throughout the project. Participants provided informed consent to participate in each of the research studies that contributed to the intervention development.

Consent for Publication

Not applicable.

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Declaration of Conflicting Interest

The authors declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Nele Demeyere is a developer of the Oxford Cognitive Screen.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Supplemental Material

Supplemental material for this article is available online.

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