Interreg CENTRAL EUROPE
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VReduMED

Projects concepts for developing innovative VR-based solutions for care education

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Executive Summary

This document presents three project concepts jointly developed within the VReduMED partnership to explore how Virtual Reality (VR) can contribute to education and training in healthcare. The concepts emerged from a structured, step by step innovation process that combined regional stakeholder input, partner driven ideation and practical testing through several pilot activities. Across all participating regions, ten open innovation workshops brought together healthcare institutions, educators and VR/MedTech companies to identify areas where immersive learning could provide added value. In total, these workshops generated 38 ideas, ranging from procedure and emergency training to communication scenarios, environmental simulations and rehabilitation related use cases.

Building on this broad idea base, the consortium conducted two joint innovation workshops in which partners developed, clustered and prioritised their own concepts using transparent selection methods. From this process, three themes emerged as particularly promising due to their educational relevance, feasibility and cross regional transfer potential:

- AI based communication support in caretaking,
- Stress prevention and emotional resilience for healthcare staff,
- Home based physical therapy supported through immersive VR.

These themes were then further shaped through VReduMED's pilot activities. The first pilot examined the technical readiness of the project's established VReduMED laboratories, confirming that equipment, space and network conditions were suitable for cross-border VR collaboration. The second pilot explored whether innovation workshops could be conducted directly inside virtual environments, demonstrating that virtual collaboration is effective when onboarding and group structure are carefully planned. The third pilot, a two-day co-creation hackathon, showed that interdisciplinary teams can create high-quality VR learning scenarios within a short period using accessible tools, without in depth technical knowledge.

Together, these steps resulted in three early-stage concepts that illustrate how VR can support learning across different areas of healthcare. The concepts are included in the project's sustainability seeking to enable future continuation and scale-up.

A. Objective of this output

The purpose of this document is to present three jointly developed project concepts that can serve as the basis for future transnational initiatives in VR-supported care education. This output aims to:

- consolidate findings from stakeholder ideation, consortium workshops and pilot activities;
- translate these insights into three structured concept outlines that address educational needs in healthcare;
- demonstrate how VR can support learning in clinical, communicative and rehabilitation-related contexts;
- and provide a foundation for potential future cooperation, follow-up projects, funding applications and long-term scale-up activities.

1. Ideation and Working Process

This chapter describes how the project consortium developed the three concepts presented later in this document. It outlines the steps taken to gather ideas, select the most promising ones and explore suitable methods for creating immersive learning scenarios. The chapter also highlights how the project team combined stakeholder perspectives, partner collaboration and practical development work to form a coherent working process.

1.1. Stakeholder Ideation

Across all project regions, open innovation workshops brought healthcare institutions and MedTech/VR companies to explore where immersive learning could add value in education and training. In total, 10 workshops engaged 158 participants with a balanced VR background (roughly half with prior VR experience), and produced 38 ideas that span procedure training, emergencies, communication, environment simulations, rehabilitation and curriculum use cases. The full idea list is provided in the Appendices chapter of this document.

Key takeaways that directly informed concept selection and scenario design:

- **Didactic quality first:** Stakeholders asked for scenarios that deliver clear learning value, provide immediate feedback, and reflect current clinical standards; routine skills that are already easy to teach offline should stay offline.
- **Short, repeatable formats**: Shorter modules with variations, to support iterative practice.
- **Clarity and usability**: Clear instructions, simple interactions, and visible affordances reduce frustration; onboarding is essential because many learners are new to VR.

These inputs provided the thematic baseline for the partners' internal selection and for the hands-on scenario creation approach described in the following sections and are also incorporated in the VReduMED Handbook, targeting regional care education and the VReduMED Roadmap.

Figure 1: Open innovation workshops brought healthcare institutions and MedTech/VR companies together to explore where immersive learning could add value in education and training (photo: VReduMED)

1.2. Consortium Ideation and Selection of Concepts

Following the regional stakeholder workshops, the project partners held two joint innovation workshops to develop and prioritise partner-driven ideas for future cross-border cooperation. These sessions brought together representatives from all participating organisations and focused on identifying topics with strong educational relevance and realistic development potential.

During the first workshop, partners generated a wide range of ideas using structured group work. Individual ideas were collected, clustered and discussed before being placed in a joint prioritisation matrix. Each participant then rated the ideas using a points-based system

In the second workshop, the highest-rated ideas were further developed in small transnational groups. Each group expanded one of the shortlisted topics by defining its purpose, potential users, scope, added value and first implementation steps. This process resulted in the creation of concise concept drafts, which covered topics such as:

- AI-based communication assistance in healthcare,
- VR-supported stress management for nurses,
- VR for physical therapy and rehabilitation, and
- an educational VR game for children promoting health awareness

From this refined set, the partners jointly selected the three concept themes that were considered most promising in terms of educational impact, feasibility and cross-regional relevance. These selected concepts were then included in the project's Sustainability Plan, ensuring that they will be pursued further beyond the project's lifetime. The consortium intends to explore opportunities for upscaling, for example through follow-up cooperation, additional funding schemes and broader adoption in education and training environments. These three selected concepts are described in the next chapter.

Figure 2: The VReduMED consortium conducted internal open innovation sessions, to generate project concepts based on the findings. (photo: VReduMED)

1.3. Contribution of Pilot Actions

The pilot activities played an important role in supporting the development process. Each activity tested different aspects of cross-regional collaboration and helped determine how VR can be used effectively in joint development work.

1.3.1. Pilot activity 1: VReduMED lab infrastructure

Pilot activity 1 examined whether the participating VReduMED laboratories and mobile setups were technically ready for joint use across regions. The tests assessed available equipment, required physical space and network performance at all sites. The results showed that all labs provided stable conditions for VR applications, including reliable connectivity and suitable room layouts for safe use. This pilot confirmed that the technical environment needed for collaborative VR work is in place, ensuring that later development and co-creation activities could be carried out effectively.

Figure 3: Participants testing VR equipment and room-scale setup in one of the VReduMED labs during the infrastructure pilot activity. (photo: VReduMED)

1.3.2. Pilot activity 2: VR-based workshops

In the next step, the project explored whether collaborative workshops could be conducted directly inside virtual environments. The tests showed that VR-based workshops work well when participants receive proper onboarding, when group sizes remain manageable and when sessions are structured in shorter blocks with breaks. These findings helped define the practical requirements for using VR as a tool for cross-regional co-creation.

Figure 4: Virtual collaboration setting in which participants explored shared VR workshop methods inside a MeetinVR environment. (photo: VReduMED)

1.3.3. Pilot activity 3: Co-creation hackathon

The third pilot activity tested how interdisciplinary teams can design educational ideas from concept to prototypes. During a two-day hackathon, participants from nursing and informatics worked together to create short training scenarios. They could either build on ideas from the earlier stakeholder workshops or develop new scenarios based on their own experience. Further details to the developed scenarios, can be found in chapter 3 of this document. The pilot showed that interdisciplinary groups can quickly create meaningful VR learning content and demonstrated how collaborative development formats support the overall concept-creation process.

Figure 5: Participants collaborating during the two-day hackathon, working in teams to design and develop 360° VR learning scenarios in healthcare education. (photo: Sensorik Bayern)

2. Jointly Developed Project Concepts

2.1. Project Concept 1: Integration of AI-based communication in caretaking

2.1.1. Foundation

The first transnational project concept targets the responsible integration of AI-based communication support in care services through VR technology. The focus is not on replacing staff or building a generic chatbot. Instead, the project develops a carefully bounded communication layer that helps nurses, home-care teams, social-care workers and care coordinators handle recurring communication tasks more safely, consistently and in a more person-centred way, using the immersivity and interactivity of VR-based tools.

Unlike the earlier AI concept focused mainly on healthcare administration, this concept addresses communication in the actual care pathway: shift handovers, patient and family information, multilingual clarification of care instructions, escalation messages, appointment reminders, documentation prompts, and support for cross-organisational coordination between home care, primary care, rehabilitation and long-term care.

The project design is directly shaped by the lessons learned from VReduMED. That means co-creation with users from the start, role-specific onboarding, train-the-trainer for supervisors, staged testing in real organisations, a mix of short demonstration formats and longer integration phases, and sustainability through a permanent transnational transfer forum rather than one-off piloting.

2.1.2. What is new in the concept

Component	Design implication
Main innovation focus	A bounded AI communication layer for care teams, patients and relatives, with human oversight built into each workflow rather than a broad automation project.
Main target settings	Home care, long-term care, discharge support and ambulatory coordination, where fragmented communication often causes rework and stress.
Difference from earlier concepts	The concept is communication-centred and practice-oriented. It combines workflow prompts, multilingual support and safe escalation patterns rather than generic process optimisation.
Realistic adoption pathway	Pilot-ready use cases, staff training, governance templates, and phased roll-out through a transnational implementation community.

2.1.3. Problem statement and rationale

Care providers often operate in all sorts of environment settings: ward, community, home care, outpatient rehabilitation and social support. Communication breaks occur at every transition point. Staff often rewrite the same information for colleagues, relatives and partner organisations. In home care and long-term care, shortages of time and language diversity increase the risk of misunderstanding, missed follow-up or low-quality handover.

At the same time, providers are cautious about AI because communication in care is sensitive. That caution is justified. A realistic project must define where AI adds value, where human review remains mandatory, and how data protection, traceability and transparency are handled in day-to-day practice.

The concept uses the strongest implementation lessons from the VReduMED documents: start with user needs, test in realistic settings, provide low-threshold onboarding, combine short demo formats with longer integration phases, use fixed and mobile VR labs or loan kits, address hygiene and motion-sickness concerns for shared hardware, collect structured feedback, and anchor transfer through forums, train-the-trainer offers and publicly reusable implementation materials. This concept therefore starts with bounded use cases and governance by design.

2.1.4. Overall objective and specific objectives

The overall objective is to develop, test and transfer a safe AI-supported VR-based communication model for care services that improves continuity of care, reduces communication friction and strengthens staff confidence in using AI responsibly.

The concept pursues the following specific objectives:

- map communication pain points in nursing and home-care pathways;
- select or create a VR-based environment ready for processing AI inputs;
- co-design a set of bounded AI assistance modules;
- create governance and quality-assurance templates;
- pilot the modules in care settings with different digital maturity levels;
- build train-the-trainer/ onboarding packages;
- create a transnational forum and transfer package for post-project take-up.

2.1.5. Proposed solution architecture

The project develops a modular VR-based AI communication kit instead of one monolithic platform. Each module addresses a practical communication task with clear human-in-the-loop control. Examples include draft support for family updates, plain-language rewriting of care instructions, multilingual support for routine communication, handover structuring prompts, discharge follow-up reminders, template-based escalation notes, and retrieval of approved organisation-specific guidance.

To keep the concept realistic, the pilots would not attempt full integration with every electronic health record. The project would test three integration levels: stand-alone assisted drafting, semi-integrated use with copy-and-check workflows, and API-based connection where local conditions allow it. This pragmatic staged approach reflects lessons from the VReduMED pilots, where low-threshold first contact and gradual institutional integration produced better uptake than technology-heavy roll-out models.

- Use case A: assisted shift handover generation based on approved structure and local terminology.
- Use case B: draft replies and updates for patients and relatives in plain language and, where needed, another language.
- Use case C: prompts for referral and coordination messages across home care, rehab and general practitioner settings.
- Use case D: communication support for new staff and trainees during supervised learning situations.

2.1.6. Lessons translated into the delivery model

Component	Design implication
Low-threshold onboarding	Every pilot site begins with demonstration sessions, staff familiarisation and supervised practice. The project does not assume AI readiness.
Train-the-trainer	Supervisors and educators receive a facilitator package so adoption does not depend on the project team alone.
Short plus longer testing	Following the pilot logic of demonstrations plus longer integration phases, each site first tests quick scenarios and then runs a structured longer use phase.
Mobile support format	Where institutions lack infrastructure, the project provides a portable implementation VR kit with configured devices, guidelines and support sessions.
Forum-based sustainability	A transnational Care Communication Forum continues beyond the grant and hosts exchange, cases, updates and matchmaking. Networks created in VReduMED play an important role in this point

2.1.7. Target groups and partnership model

Primary target groups are nurses, home-care professionals, care coordinators, quality managers, discharge managers, care educators and care students. Secondary target groups are patients and relatives, AI SMEs, digital health providers, public authorities, cluster organisations and training providers.

The partnership should combine one nursing or care education lead, one applied research partner on VR, AI and human-centered design, two to three care providers from different countries, one home-care organisation, one SME or technology provider, one business or cluster intermediary, and one public or regional innovation actor. This creates the same cross-sector logic that worked well in VReduMED, but redirects it toward VR-based AI communication in care.

2.1.8. Proposed work packages and outcomes

WP	Purpose	Lead type	Main outcomes
WP1	Needs analysis, communication mapping, ethics and co-design	care research / university	needs map, user stories, good practice examples, evaluation plan
WP2	Development of modular VR-based AI communication assistants	SME / applied AI partner	prototype modules, interface mock-ups, local configuration guides
WP3	Onboarding, train-the-trainer and implementation kit	care education partner	trainer package, quick-start guides, scenarios, supervision model
WP4	Pilots in home care, long-term care and transition pathways	care provider	pilot reports, user feedback, improvement loops
WP5	Transfer, procurement and policy support	cluster / public partner	implementation templates, procurement notes, regional recommendations
WP6	Sustainability and Care Communication Forum	all partners	forum model, follow-up roadmap, hosted repository of materials

Note: the proposed work packages are based on the concept structure, the eventual real work package structure will depend on specifications or requirements of the funding programme into which it would be submitted.

2.1.9. Pilot methodology

The pilot design should mirror what the VReduMED lessons learnt showed to be effective: a structured entry point, realistic settings, and enough time for actual integration. Each pilot site therefore follows the same five-step logic.

- communication tasks are mapped and prioritised in cooperation with staff;
- the site runs low-threshold demonstration sessions.
- a supervised short pilot phase tests two or three scenarios.
- one or two chosen modules enter a longer integration period of six to eight weeks.
- the piloting body reviews outcomes with users and management and decides whether and how to continue.

Evaluation combines staff surveys, structured observation, communication quality review, estimated time savings, number of corrected drafts, perceived trust, and user confidence. The point is not to prove a magic productivity gain but to identify safe and useful use cases that actually fit care practice.

2.1.10. Indicative success indicators

Indicator	Target direction	Why it matters
Staff completing onboarding and supervised first use	high participation across all pilot sites	Adoption depends on confidence and clarity, not only technical availability.
Bounded use cases validated in practice	at least 6 to 8 robust scenarios	A realistic project should validate a manageable number of scenarios well.
Pilot sites continuing after the project	majority of sites commit to continued use or follow-up testing	Shows organisational ownership beyond grant delivery.
Trainer pool established	minimum two trained facilitators per site	Supports sustainability and internal roll-out.
Transfer outputs reused externally	downloads, requests or follow-up workshops in additional organisations	Indicates wider territorial relevance.

2.1.11. Sustainability and post-project continuation

The Care Communication Forum creates a visible home for exchange, transfer, matchmaking and follow-up project generation. In this concept, the forum becomes the backbone for long-term uptake. It would host webinars, annual exchange meetings, implementation clinics, case libraries and peer support for organisations starting their own pilots. Thus, it is proposed to maintain the forum active after the project end for as long as possible.

The project website and tool repository should remain available, too. Partners should agree early on which materials remain public, which templates require adaptation support, and how updates are maintained. The longer-term exploitation route is not a single product launch. It is a blended pathway of public transfer materials, SME service offers, and follow-up regional or national implementation projects.

2.1.12. Implementation risks and mitigation

Risk	Likely issue	Mitigation approach
Over-automation expectations	Partners may expect broad productivity gains too early	Keep scope narrow, define bounded use cases and require human review for sensitive outputs.
Data governance concerns	Care providers may fear unsafe or non-compliant use of processed data	Provide local deployment options where possible, clear governance templates and staff guidance.
Low user trust	Staff may avoid the tools if they feel watched or replaced	Frame the solution as assisted communication with user control and practical training.
Uneven digital maturity	Sites differ strongly in infrastructure and readiness	Use staged technical models and portable support packages for lower-maturity sites. Train-the-trainer session should partly alleviate this risk.

2.1.13. Indicative budget requirements

Budget item	Reason for inclusion
User research and co-design effort	Needed to identify bounded, high-value scenarios and avoid building unused features.
Prototype development and local configuration	Core technical work for modular assistants, interfaces and language support.
Training and supervised onboarding	Critical because uptake depends on trust, role clarity and safe first use.
Pilot support and evaluation	Required for site visits, feedback loops and a longer integration phase.
Transfer forum and hosted repository	Ensures public value and sustainability within and beyond the funded project.

2.1.14. Why this concept is fundable and realistic

This concept is realistic because it avoids the usual overreach of AI in care. It does not promise autonomous decision-making. It focuses on communication quality, continuity and staff support. It uses a staged roll-out model suited to institutions with different digital maturity. It also fits well with European and regional priorities around digital transition, workforce resilience, home and community care, and trustworthy AI.

Most importantly, it stands on lessons already proven useful in previous projects: low-threshold first contact, mixed demonstration and integration formats, structured evaluation, and sustainability through transfer structures rather than one-off pilots.

2.1.15. Example pilot site journey

A realistic pilot site journey helps funders and partners see how the concept would work in practice. In month one, a provider joins the project and nominates a local implementation lead. In months two and three, staff participate in interviews and communication mapping. In month four, the site receives a first demonstration package and tests short guided scenarios using anonymised or synthetic examples. In months five and six, local governance rules are finalised and trainers are prepared.

During the longer integration phase, selected teams use the AI assistance modules for a limited set of communication tasks under supervision. Supervisors review draft quality, escalation patterns and user confidence. Managers do not treat the pilot as a productivity contest; instead they focus on whether the supported communication becomes more consistent, less burdensome and easier to understand. At the end of the cycle, the site decides on continuation, adaptation or a stop-go decision for each module.

2.1.16. Capacity-building

The capacity-building model combines orientation sessions, role-specific training and practice exchange. Frontline staff need simple first-use confidence. Supervisors need review and facilitation skills. Management needs a realistic understanding of scope, governance and implementation cost. Educators need cases and scenarios they can reuse in further training.

2.1.17. Indicative timeline

The project's duration is planned for 36 months, under optimal circumstances, which corresponds to maximum project duration at many EU funding schemes in standard calls for proposals.

The first six months are reserved for preparation, mapping and governance design. Months seven to fourteen focus on prototyping and local configuration. Months fifteen to twenty-six cover pilot implementation in waves so that later sites can benefit from early lessons. Months twenty-seven to thirty-two focus on transfer products, public workshops and procurement-oriented support. The final period consolidates the forum, follow-up project ideas and host arrangements for the public repository.

This staged timeline is deliberately cautious. It reflects the lessons learnt from pilot actions in VReduMED – that first-time adoption works best when partners do not rush directly into full-scale deployment but allow space for onboarding, iteration and practical integration.

2.1.18. Stakeholder value proposition

For frontline care staff, the main value is not abstract AI capability but fewer repetitive rewrites, clearer communication structures and better support for multilingual or plain-language communication. For managers, the value lies in improved continuity, clearer governance and a safer route to experimentation. For educators, the concept creates reusable training cases that help staff learn to use AI responsibly in bounded tasks.

For SMEs and solution providers, the project offers something equally important – access to realistic use cases, implementation feedback and cross-country learning from providers with different organisational conditions. This combination of provider value and supplier learning increases the chances that any resulting solution remains realistic rather than over-engineered.

2.1.19. Benefits to the target groups

Audience	Primary expected value	Transfer implication
Care staff	less communication friction and more consistency	Supports uptake when framed as assistance, not replacement
Patients and relatives	clearer and more understandable communication	Strengthens trust and inclusion
Care organisations	lower rework and better continuity across settings	Improves willingness to continue after the pilot
Educators and trainers	practice-based AI literacy cases	Enables reuse in CPD (Continuing Professional Development) and pre-service education
SMEs and tech partners	validated use cases and implementation feedback	Supports follow-up service and product development

2.2. Project Concept 2: Stress prevention and emotional resilience for healthcare staff

2.2.1. Executive summary

HOME-RELIEF VR is a transnational project concept focused on stress prevention and emotional resilience for nurses and other healthcare staff during shift work. It concentrates on clearly identifiable stress sources such as worried relatives, patients needing clarification, overlapping tasks, administrative workload and the strain of shift-based routines rather than claiming to solve all stressors in healthcare.

The project develops a realistic package consisting of a VR platform with short stress-relief modules, curated visual and audiometric scenarios, optional minigames, reflective learning elements and a practical implementation model for healthcare providers. It also creates a route for uptake through hygiene-ready device kits, structured onboarding, supervisor guidance and implementation materials that can be used by hospitals, care facilities and training organisations.

The design decisions are directly informed by the results of the VReduMED project: low-threshold access, user-centred design, short testing formats followed by longer integration phases, clear technical requirements, structured before-and-after stress measurement where feasible, and sustainability through guidelines, transfer formats and reusable implementation materials.

2.2.2. Why this concept is distinct

Component	Design implication
User group focus	Nurses and healthcare staff in hospitals, care facilities and comparable care settings, where stressors include worried relatives, patients needing clarification, overlapping tasks, administrative workload and shift work.
Main innovation	A user-centred VR platform or hub with short stress-relief methods, simulation-based support and optional stress monitoring rather than a generic wellness offer.
Deployment model	Borrowable or site-based device kits, managed hygiene protocols, short sessions during breaks or after difficult situations, and optional supervised use in staff rooms or training spaces.
Transfer logic	Designed for transfer across hospitals, care institutions and training providers, including organisations with limited digital infrastructure.

2.2.3. Problem statement and rationale

Staff members move back and forth between different households, handle emotionally taxing situations—such as dealing with patients who need information about their health condition and care, or with family members who are worried and seeking answers to their questions—take care of administrative tasks in between, navigate difficult transitions during shift work, and often process stressful experiences all on their own while driving to their next assignment. Healthcare work combines high responsibility with repeated stress exposure. Nurses and other healthcare staff often face situations in which patients need clarification about their condition and care, relatives are worried and demand answers, several tasks have to be carried out simultaneously, administrative duties compete with direct care, and shift work reduces opportunities for recovery. These pressures are especially visible in inpatient and acute care settings, but they also occur in other care environments.

These stress patterns can be described within occupational health frameworks such as the job demand-resource model: high emotional demands, time pressure and frequent interruptions are combined with limited recovery time during shifts. Rather than addressing every source of stress at once, the project focuses on selected, recurring stress situations where immersive support can realistically make a difference. Short recovery moments during breaks, after difficult interactions or between demanding tasks are central use cases.

From a behavioural and learning perspective, effective stress prevention requires more than information alone. Healthcare professionals benefit from guided experiences that support emotional regulation, reflection and confidence in difficult encounters. In this concept, VR is not positioned as a replacement for human communication, but as a structured support tool: it can provide calming sensory environments, guided coping exercises and simulation-based practice while also offering a stronger sense of immersion and attentional focus than conventional screen-based formats. This makes it particularly suitable for short, protected recovery moments during breaks or immediately after stressful situations.

Traditional wellbeing offers often fail because they are too generic, too long or poorly matched to healthcare routines. A realistic innovation therefore has to fit break structures, shift work and the practical constraints of care settings: short sessions, portable or easy-to-store hardware, simple hygiene procedures, straightforward setup and a management model that supports voluntary use.

The mobile VR lab and pilot outputs show that low-threshold access matters. Institutions adopt new tools more readily when they can borrow ready-to-use kits, receive clear technical guidance and test the solution in their own environment before making procurement decisions. The concept also reflects the PDF idea of integrating stress monitoring where legally and ethically feasible, for example through simple before-and-after self-reporting or carefully assessed physiological measures, while taking user comfort, motion-sickness prevention and regulatory requirements seriously from the start.

The advantage of the VR solution is that not only can immersive audiovisual environments, minigames, and the like serve as a means of relaxation, but stress levels can also be measured very accurately in real time using various methods such as pupil dilation and audiometry.

2.2.4. Overall objective and specific objectives

The overall objective is to develop, pilot and transfer a VR-supported stress-relief model for nurses and healthcare staff that addresses defined stress sources in routine care settings and remains sustainable beyond the funded period.

Specific objectives are to

- map relevant stress patterns and prioritise realistic use cases;
- co-create VR stress-relief methods and reflective scenarios;
- define a safe deployment, hygiene and onboarding concept;
- train supervisors and peer facilitators;
- pilot the package across multiple healthcare settings;
- and produce a public transfer model including implementation and regulatory guidance.

2.2.5. Solution concept

The project develops three complementary intervention layers. The first layer consists of short immersive stress-relief modules lasting three to seven minutes and designed for use during breaks, before demanding shift blocks or after emotionally taxing encounters. The second layer consists of guided reflective or simulation-based scenarios that help staff rehearse difficult interactions, especially communication with worried relatives and patients needing clarification. The third layer is a supervisor and peer-support toolkit that connects individual use to organisational stress prevention instead of treating stress solely as a private issue.

The intervention design is operationalised through a set of clearly defined VR use cases that reflect the stress sources. These use cases translate the conceptual layers into concrete, practice-oriented application scenarios.

Scenario 1: Short break-based stress relief

During or between shifts, staff can use short VR modules for rapid down-regulation. These may include calming visual environments, guided breathing, audiometric scenarios or simple minigames that help users refocus and decompress within a limited time window.

Scenario 2: Communication and explanation support

Healthcare professionals frequently encounter situations involving uncertainty, tension or repeated questions from worried relatives and patients. This scenario uses immersive simulation and reflective prompts to rehearse communication strategies, expectation management and boundary-setting. In selected implementations, explanatory VR content for relatives may also be tested as a complementary measure to reduce repetitive pressure on staff without replacing real conversations.

Scenario 3: Self-regulation and stress monitoring

This scenario focuses on building individual coping strategies through guided breathing, attention control and structured self-reflection. Following the PDF concept, the platform can include stress monitoring before and after use where appropriate and compliant, in order to demonstrate impact and help users select the most suitable stress-relief method.

To remain realistic, the project would use a limited set of curated VR experiences within a platform or hub model rather than a large bespoke content library. New content would be created only where the mapping process shows clear gaps. This reflects both the VReduMED implementation logic and the PDF proposal for a user-centred VR app that combines existing stress-relief methods with targeted new development.

- Stress-relief type 1: calming visual scenarios for break-time recovery.
- Stress-relief type 2: guided breathing, audiometric content and light minigames for refocusing.
- Scenario type 1: reflective debrief after difficult interactions with patients or relatives.
- Scenario type 2: confidence-building around communication, uncertainty and competing tasks.
- Support tool: simple stress check, before-and-after measurement workflow and debrief card for supervisors and peer facilitators.

2.2.6. Delivery model shaped by project lessons

Component	Design implication
Mobile deployment	Borrowable kits and practical site deployment are inspired by the mobile VR lab concept and by loan-based testing in pilot actions.
Low-threshold onboarding	Staff need demonstration, simple first steps and non-technical language. First-use support is built in.
Technical realism	Use of standalone headsets, battery-ready accessories, cleanable face covers and stable network connections where needed.
Health and comfort safeguards	Session length, contraindications, seating options, hygiene, motion-sickness precautions and any measurement procedures are standardized from the start.
Blended implementation	Short trial events are followed by a longer use phase so providers can judge whether the concept works in everyday healthcare practice.

2.2.7. Target groups and consortium model

Primary target groups are nurses and other healthcare professionals working in hospitals, care facilities and related healthcare settings, as well as ward coordinators and team leaders. Secondary target groups are occupational health staff, healthcare educators, psychologists, wellbeing experts, SMEs offering immersive content, device and accessory providers, insurers interested in prevention, and regional innovation actors.

The ideal consortium includes at least one hospital or care-facility lead organisation, one university or applied research partner with expertise in nursing or occupational health, one XR content partner, one cluster or business support actor, one vocational education or CPD provider, and several pilot healthcare institutions from different countries. This makes the concept scalable across inpatient care, long-term care and other clinical contexts.

2.2.7.1. Work packages and outputs

WP	Purpose	Lead type	Main outputs
WP1	Stress mapping, co-design and implementation planning	healthcare / research partner	stress map, personas, ethical framework, pilot protocol
WP2	VR content curation and targeted scenario development	XR SME	curated content set, new stress-relief modules, facilitator notes
WP3	Platform setup, onboarding and hygiene concept	technical / care partner	deployment kit, setup guide, hygiene protocol, comfort checklist
WP4	Pilots in healthcare institutions	healthcare provider consortium	site reports, user feedback, iteration cycles
WP5	Supervisor training, peer support and transfer package	education partner	train-the-trainer, debrief tools, provider handbook
WP6	Forum, sustainability and scale-up pathways	cluster / public actor	community of practice, procurement guidance, follow-up roadmap

2.2.8. Pilot pathway

Each pilot should begin with a short mapping phase to identify which stress sources and use moments are most relevant in the participating setting. Some institutions may prefer use during scheduled breaks, others after difficult incidents, and others in staff rooms, supervision sessions or training settings. The pilot should stay focused on a predefined set of pain points gathered through questionnaires and co-design.

After mapping, the project runs introductory demonstration sessions with opt-in trial use. The longer pilot phase should then last at least six weeks to account for shift rotation, workload patterns and the time required to build acceptance. Pilot sites are encouraged to nominate peer facilitators who help colleagues with first-use support. This reflects the train-the-trainer logic from VReduMED.

2.2.8.1. Indicative success indicators

Indicator	Target direction	Why it matters
Staff reporting the concept as feasible in real healthcare routines	majority positive feasibility rating	Practical fit matters more than novelty.
Number of providers adopting the VR kit or platform model	multiple providers continue or replicate after piloting	Shows the solution works beyond one flagship site.
Supervisor / peer facilitators trained	minimum two per site	Essential for uptake without constant external support.
Reported benefit after difficult visits	clear positive trend in self-reported immediate recovery	Matches the project's prevention focus.
External transfer interest	requests from additional providers, networks or regions	Indicates sustainable relevance.

2.2.9. Sustainability and continuation

The sustainability strategy is designed for realistic healthcare uptake. Instead of relying on a single proprietary platform contract, the project produces a modular package: implementation handbook, hygiene protocol, onboarding script, curated session library, stress-measurement guidance, supervisor guide and device-kit specifications.

The roadmap and handbook also point to the value of a standing exchange forum that continues beyond a single grant cycle. Such a forum creates a visible home for transfer, matchmaking and follow-up project generation. It can keep implementation materials updated, connect healthcare providers, educators, SMEs, public actors and insurers, and support follow-up procurement or funding applications.

2.2.9.1. Implementation risks and mitigation

Risk	Likely issue	Mitigation approach
Low routine fit	Staff may see VR as one more task in an overloaded day	Co-design realistic use moments and keep sessions very short.
Hardware hygiene or wear concerns	Shared use can trigger practical resistance	Use replaceable cleanable covers, clear protocols and limited shared-user ratios.
Scepticism among first-time users	Some staff may feel unsure or uncomfortable using headsets	Offer opt-in introduction, seating options and plain-language support.
only a few individuals benefit	Without management support, the benefits may be limited	Train supervisors and connect individual use to team reflection and prevention policy.

2.2.9.2. Indicative resource logic

Budget line / effort block	Reason for inclusion
Mapping and co-design with healthcare providers	Needed to tailor the concept to real stress sources and break-time routines.
Device kits and accessories	Portable headsets, chargers, cleanable covers and transport cases are central to feasibility.
Curated and targeted content development	Combines efficiency with customization where prioritised stress patterns require specific scenarios.
Training and peer facilitator support	Sustains use in everyday healthcare practice.
Evaluation and transfer activities	Necessary to generate provider-ready evidence, recommendations and scale-up materials.

2.2.10. Why this concept is fundable and realistic

This concept is realistic because it addresses a concrete workforce challenge with a delivery model suited to everyday healthcare routines. It does not depend on heavy infrastructure. It focuses on short sessions, practical hardware, voluntary use and organisational support that care providers can realistically test and adopt.

It is also clearly distinct from a generic wellbeing app. The initiative is based on clearly defined stress sources and combines VReduMED lessons on onboarding, hardware readiness, user comfort and transfer with a user-centred VR platform approach that can include visual scenarios, minigames, audiometric content and measured impact.

2.2.11. Example provider pathway

A typical provider pathway begins with one healthcare organisation volunteering a small test cohort. Team leaders identify realistic use moments, for example during breaks, after difficult interactions with relatives, before demanding shift blocks or in scheduled debrief sessions. Staff receive a guided introduction with opt-in use, comfort checks and clear information about any measurement procedures. No one is forced into headset use.

Once the pilot site has identified feasible use moments, a six- to eight-week pilot phase starts. Devices are stored in a staff room, training area or supervised cabinet and used through a simple booking or supervised access model. Peer facilitators help colleagues with setup and capture feedback. The organisation then assesses which elements have proven effective: immediate stress relief, better communication confidence, useful break-time recovery or stronger integration into team routines.

2.2.12. Training and organisational embedding

The training program consists of three stages. In the first stage, employees are introduced to basic setup, safety regulations, hygiene procedures and the purpose of the program. Stage two trains peer facilitators to help colleagues use the platform safely and confidently. Stage three is aimed at managers, occupational health staff and educators and shows how to integrate the concept into prevention strategies, staff support and evaluation routines, including compliant stress measurement where relevant.

Organisational embedding matters because stress prevention fails when it is treated as a private afterthought. Healthcare providers should therefore define how this approach links to break culture, supervision, induction, support after difficult incidents, team reflection and personnel strategy. This keeps the initiative realistic and prevents it from remaining a short-lived pilot.

2.2.13. Indicative timeline and transfer pathway

The first project phase covers stress-source analysis, ethics and regulatory review, content curation and device-kit design. The second phase develops the onboarding, facilitator and measurement model. The third phase runs pilots in waves, beginning with simpler break-time use and then adding more advanced simulation and reflection formats where suitable. The final phase converts the strongest findings into a provider-ready package, dissemination events and a standing exchange structure.

For smaller providers, the transfer pathway can begin with a shared regional pool of kits or a hosted demonstration service. This is consistent with the mobile-lab logic in the VReduMED materials and lowers the threshold for uptake in organisations with limited in-house digital infrastructure.

2.2.14. Practical deployment scenarios

Different healthcare providers will need different deployment patterns. A hospital ward may operate a shared device cabinet and structured break-time slots. A care facility may use the platform for post-incident support and team reflection. A larger provider may integrate the concept into supervision and onboarding for new staff. The project should therefore validate several practical models rather than prescribing one fixed routine.

This flexibility reflects the pilot materials, where the same core approach was transferred across different organisational settings through a combination of standardised guidance and local adaptation.

2.2.15. transfer-ready provider models

Scenario	Where used	Operational advantage
Team-based relaxation	during scheduled breaks or after shift handover	easy supervision and device storage
Post-incident support	after difficult or traumatic visits	targets moments of highest need
Peer reflection session	during team meeting or supervision	connects individual stress with team learning
New staff resilience onboarding	during induction	builds confidence, acceptance and coping routines early
Shared regional demonstration service	for smaller providers	lowers entry cost and supports wider transfer

2.3. Project Conecpt 3: Home-based physical therapy

2.3.1. Executive summary

Healthcare systems across Europe are facing increasing pressure due to demographic change, rising rehabilitation needs and limited therapy capacities. Many rehabilitation programmes rely heavily on exercises performed by patients between supervised therapy sessions. However, adherence to home exercises remains one of the major challenges in rehabilitation. Patients often feel insecure about performing movements correctly, lose motivation over time or discontinue exercises prematurely.

Virtual Reality (VR) technologies have recently emerged as promising tools to support learning, training and behavioural change. Immersive environments can provide visual guidance, interactive feedback and motivating scenarios that help users perform repetitive tasks more consistently. In rehabilitation contexts, VR can therefore support patients during home exercise phases by providing structured guidance and increasing engagement.

The PHYSIO-VR HOME concept aims to explore how VR technologies can be integrated into home-based physical therapy pathways. The project builds upon experiences gained in the VReduMED project, particularly regarding the use of VR laboratories, low-threshold onboarding strategies and structured pilot testing. The goal is not to replace therapists but to strengthen existing rehabilitation pathways through a blended approach combining professional supervision and immersive home training.

2.3.2. What makes this concept different

Component	Design implication
Core focus	Development and validation of a VR-supported home therapy model that complements existing physiotherapy pathways. The concept focuses on rehabilitation situations where patients perform structured exercises independently between supervised therapy sessions. Immersive VR environments provide guided exercise sequences, repetition support and motivational elements to improve adherence and confidence during home-based rehabilitation.
Primary users	The primary users are patients who perform prescribed physiotherapy exercises at home as part of a structured rehabilitation programme. The concept particularly addresses patients with clearly defined and repeatable exercise routines, such as mobility training, joint rehabilitation or strengthening exercises. Secondary users are physiotherapists and rehabilitation providers who define the exercises, introduce the VR application and monitor patient progress within the therapy process.
Innovation type	The innovation lies in the development of a blended rehabilitation model that combines supervised therapy sessions with immersive home exercise support. Instead of focusing solely on VR technology, the concept introduces a service model in which therapists prescribe exercises that patients practice independently using portable VR systems. The immersive environment provides structured guidance, visual feedback and motivational elements while remaining embedded within professional therapeutic supervision.
Adoption route	Adoption follows a stepwise implementation pathway. Rehabilitation providers can first test VR-supported exercises in controlled environments such as therapy centres or VR labs. After therapist training and patient onboarding, the technology can be integrated into supervised therapy sessions and later extended to home-based use through portable VR kits. Training materials, onboarding procedures and implementation guidelines support healthcare organisations in integrating the approach into existing rehabilitation workflows.

2.3.3. Problem statement and rationale

Physical therapy at home often depends on whether patients understand the exercises, feel confident enough to repeat them correctly, and stay motivated between supervised sessions. Paper handouts and standard videos can help, but they often fail to address confidence, boredom, fear of doing harm and the need for clear progression.

For therapists, the challenge is not only exercise prescription but adherence support, education and communication with patients and family caregivers. A realistic innovation must therefore strengthen the therapy pathway rather than attempt to replace therapy. It should support instruction, motivation and structured repetition while leaving clinical judgement with professionals.

The concept uses the strongest implementation lessons from the VReduMED documents: start with user needs, test in realistic settings, provide low-threshold onboarding, combine short demo formats with longer integration phases, use fixed and mobile labs or loan kits, address hygiene and motion-sickness concerns for shared hardware, collect structured feedback, and anchor transfer through forums, train-the-trainer offers and publicly reusable implementation materials. The concept therefore treats VR as a guided support layer embedded in a blended care model.

While various digital technologies such as mobile applications, video-based instruction or sensor-based systems are already used in rehabilitation, immersive VR offers specific added value in situations where guided practice, motivation and experiential learning are critical. Unlike passive formats, VR enables users to actively engage with structured exercise routines in a controlled and motivating environment. This makes it particularly suitable for supporting home-based rehabilitation where correct execution and sustained adherence are essential.

2.3.4. Overall objective and specific objectives

Overall objective: Design, pilot and transfer a blended VR-supported home physiotherapy model that improves confidence, adherence and quality of home exercise support while remaining feasible for therapists and patients.

Specific objectives include:

- Identification of rehabilitation pathways suitable for VR support
- Development of immersive exercise guidance scenarios
- Creation of onboarding procedures for therapists and patients
- Implementation of pilot trials in real healthcare environments
- Development of transfer guidelines enabling healthcare organisations to adopt VR-supported rehabilitation

2.3.5. Methodological Approach

The project follows a co-creation approach involving healthcare professionals, technology experts and education partners. This approach ensures that both clinical requirements and technological feasibility are considered during the development process.

The methodological framework consists of four main phases:

1. Exploration phase – analysis of rehabilitation workflows and identification of suitable therapy pathways. During the exploration phase, the project will include a structured mapping of existing rehabilitation technologies and solutions currently available on the market. This includes VR-based applications as well as alternative digital approaches such as mobile applications, video-based instruction or sensor-supported systems. The mapping aims to identify relevant solutions, analyse their maturity and assess their suitability for home-based rehabilitation contexts. In addition, selected best-practice applications will be reviewed and, where feasible, tested within pilot settings. This ensures that the project builds on existing knowledge and avoids isolated development, while positioning VR-supported approaches within the broader landscape of digital rehabilitation technologies.
2. Development phase – creation of immersive VR training environments and supporting technical infrastructure.
3. Pilot phase – testing of VR-supported rehabilitation scenarios in clinical and home environments.

4. Transfer phase – development of guidelines and training materials enabling healthcare organisations to adopt the approach.

Each phase involves continuous feedback loops between stakeholders to ensure that the resulting solutions remain practical and user-centred.

2.3.6. Regulatory and Safety Considerations

When developing digital applications in the healthcare sector, regulatory requirements must be considered at an early stage. In the European Union, software solutions that support therapeutic functions may, under certain conditions, fall within the scope of the Medical Device Regulation (MDR).

The PHYSIO-VR HOME concept therefore deliberately follows a supportive design approach. The VR application is primarily intended to guide and motivate patients while performing exercises that have previously been prescribed by physiotherapists. Diagnostic decisions, therapy adjustments and overall clinical responsibility remain entirely with qualified healthcare professionals.

Within the project, a regulatory pre-assessment will be conducted to analyse whether certain functionalities of the application could fall under the definition of software as a medical device. In particular, the assessment will consider the following aspects:

- the intended purpose of the application
- the degree of therapeutic control exercised by the software
- the role of healthcare professionals in the therapy process
- potential risks for users

If classification as a medical device becomes relevant, the applicable regulatory requirements will be analysed at an early stage and taken into account in further technical development. The aim is to ensure that the proposed solution can be implemented in a way that is both innovative and compliant with existing regulatory frameworks.

In addition, data protection requirements in accordance with the General Data Protection Regulation (GDPR) will be taken into account, particularly with regard to potential patient-related usage data collected during pilot testing phases.

2.3.7. Target groups and partnership model

Primary users are patients performing physiotherapy exercises independently at home between therapy sessions. Typical groups include patients in musculoskeletal rehabilitation, such as those recovering from orthopaedic surgery or mobility limitations.

Secondary users include physiotherapists, rehabilitation providers and informal caregivers supporting patients.

The partnership should include rehabilitation providers, universities, technology developers, education partners and intermediary organisations to ensure effective implementation and transfer.

2.3.8. Clinical workflow integration

A key design principle of the concept is that VR support must fit naturally into existing physiotherapy workflows rather than creating a separate digital service.

The typical implementation pathway follows a blended rehabilitation model consisting of several steps.

1. First, the physiotherapist identifies a suitable rehabilitation pathway and determines whether a patient is appropriate for VR-supported home exercises. During a supervised therapy session, the therapist introduces the VR application and explains the exercise sequence.
2. Second, the patient performs the first session in a supervised environment such as a therapy centre or VR lab. This onboarding phase allows therapists to check usability, comfort and safety before the patient begins home use.
3. Third, the patient performs short VR-guided exercise sessions at home over a defined period, typically several weeks. The VR environment provides structured visual guidance, pacing cues and motivational elements that support repetition and confidence during exercises.
4. Fourth, therapists review patient experiences during follow-up sessions and decide whether the VR-supported pathway should be continued, adjusted or discontinued.

This workflow ensures that clinical responsibility remains with the therapist while VR acts as a supportive tool that strengthens the home exercise phase of rehabilitation.

2.3.9. Intervention model

The intervention has four components. First, a therapist-defined pathway identifies where VR adds value: demonstration of movement, motivation through immersive tasks, orientation for repetition and pacing, and confidence building through supportive feedback. Second, the patient receives a simple loan kit with clear setup instructions and caregiver guidance where needed. Third, the therapy provider uses short review points to adjust the plan based on patient experience. Fourth, providers can choose between a basic version with stand-alone sessions and an extended version with simple progress reporting.

The content strategy should remain realistic. The project would select a limited number of therapy pathways where home repetition is especially important and where movements can be guided safely. Examples may include mobility restoration, balance-oriented routines, shoulder or knee exercise adherence, and general activity confidence after deconditioning. The emphasis is on home support between sessions, not high-risk unsupervised exercise.

1. Patient use case 1: guided home repetition after therapist instruction, with immersive cues that make practice less monotonous.
2. Patient use case 2: confidence-supporting orientation before starting a new exercise block at home.
3. Patient use case 3: caregiver-assisted home sessions using simple shared instructions.
4. Provider use case: therapist reviews use experience and adapts the pathway at defined checkpoints.

2.3.10. Design principles derived from VReduMED

The concept directly builds on implementation lessons from the VReduMED project.

Component	Design implication
Didactic first, technology second	Implementation works best when the educational or therapeutic logic is defined before the tool choice.
Onboarding is non-negotiable	Patients, therapists and caregivers all require structured first-use support and guided introduction to the technology.
Short demo plus loan period	Implementation works best when a supervised introduction is followed by a structured loan period allowing users to test the solution in real environments.
Low-threshold technology access	Mobile VR setups and loan concepts enable testing and adoption without requiring complex technical infrastructure.
Low-threshold technology access	VR applications should complement existing educational or therapeutic processes rather than create parallel digital services.
Transfer through labs and networks	Regional VR labs and partner institutions act as testing and transfer centres supporting experimentation and knowledge exchange.
Public implementation materials	Guides, checklists and scenarios remain available after the project to support wider uptake.

2.3.11. Work packages and outputs

The work package structure reflects the implementation pathway of the project, moving from therapy pathway selection and content development to pilot testing, transfer and long-term sustainability.

WP	Purpose	Lead type	Main outputs
WP1	Needs analysis, pathway selection and co-design	rehab provider / research partner	therapy pathway map, patient profiles, safety criteria
WP2	Development and adaptation of VR-supported home exercise modules and kit design	XR / rehab SME	adapted VR exercise modules, onboarding package, loan-kit specification
WP3	Therapist, patient and caregiver training	education / rehab partner	training modules, quick guides, supervision and onboarding scripts
WP4	Blended pilot implementation in clinical and home environments	provider consortium	pilot datasets, case studies, implementation logs
WP5	Transfer model and adoption support for providers and educators	intermediary / public partner	implementation handbook, CPD (Continuing Professional Development) training material, replication workshops
WP6	Sustainability network and long-term knowledge exchange	all partners	community model, hosted resources, follow-up roadmap

2.3.12. Pilot design and evaluation

The pilot should use a stepped design. Step one is therapist onboarding and pathway selection. Step two is a supervised patient introduction where fit, comfort and technical confidence are checked. Step three is a home-use phase of several weeks, supported by planned contact points. Step four is a joint review of patient adherence, experience, confidence and therapist feasibility.

The pilot design follows a structured testing methodology that enables not only the evaluation of individual VR-supported interventions but also the comparison of different implementation approaches across settings. Standardised onboarding procedures, defined observation points and comparable feedback instruments are applied across pilot sites. This approach ensures that transferable evidence is generated on how VR can be effectively integrated into routine rehabilitation workflows and under which conditions it provides the greatest benefit.

Evaluation should combine therapist feedback, patient-reported confidence, routine adherence indicators, qualitative caregiver input where relevant, and implementation feasibility. The goal is to determine where VR meaningfully strengthens home therapy and where simpler tools remain sufficient. This realism is important both for funders and for future provider uptake.

2.3.12.1. Indicative success indicators

Indicator	Target direction	Why it matters
Patients completing onboarding successfully	high rate across chosen pathways	Shows the concept is accessible to real users.
Therapists reporting good pathway fit	clear positive rating in selected use cases	Confirms that VR supports practice instead of complicating it.
Patients continuing home practice during loan phase	strong adherence trend relative to baseline routines	Captures the main practical value of the concept.
Providers willing to continue or expand use	majority of pilot organisations	Indicates real organisational feasibility.
External replication interest	requests for transfer workshops or handbooks	Measures the concept's wider relevance.

2.3.13. Implementation, sustainability and resource framework

Sustainability should combine three routes. The first is a provider-ready transfer package: handbook, onboarding scripts, kit specification, therapist guide and patient-friendly materials. The second is a continuing exchange structure linking therapy providers, educators, technology partners and public actors. The third is a progression route from small-scale loan kits to more permanent service integration where justified.

The roadmap and handbook also point to the value of a standing forum that continues beyond a single grant cycle. Such a forum creates a visible home for exchange, transfer, matchmaking and follow-up project generation. For this concept, the post-project structure could be a Home Therapy Innovation Forum hosted jointly by rehabilitation and education partners. It would continue peer learning, provider support, and preparation of follow-up projects or procurement initiatives.

2.3.13.1. Implementation risks and mitigation

Risk	Likely issue	Mitigation approach
Too broad clinical ambition	Trying to support every therapy pathway would dilute feasibility	Limit the pilot to a small number of clearly defined and safe therapy pathways identified in WP1.
Patient setup difficulties	Home use can fail if first use is confusing	Provide supervised onboarding sessions, clear step-by-step guides and optional caregiver support as defined in WP3.
Therapist workload concerns	Professionals may fear extra tasks without clear benefit	Integrate VR into existing therapy workflows and define simple review checkpoints during pilot implementation (WP4).
Mismatch between patient ability and device demands	Some users may not tolerate or manage VR well	Use eligibility and safety criteria defined in WP1 and provide alternative non-VR exercise pathways where appropriate.

2.3.13.2. Indicative resource logic

Budget line / effort block	Reason for inclusion
Co-design and clinical pathway selection	Needed to keep the concept safe, specific and relevant.
Module adaptation and home-kit preparation	Central to turning the concept into a usable service model.
Training for therapists, patients and caregivers	Essential because blended home use depends on human support.
Pilot support and evaluation	Provides the evidence base for wider transfer.
Transfer network and implementation resources	Makes the concept durable beyond the project.

2.3.14. Impact, transfer and future development

2.3.14.1. Why this concept is fundable and realistic

This concept is realistic because it strengthens an existing care pathway instead of trying to create a fully remote therapy system. It acknowledges the limits of home use, keeps therapists in control, and focuses on areas where immersive guidance and motivation can make a practical difference.

In addition, the concept establishes a structured interface between healthcare providers and European SMEs developing digital rehabilitation solutions. By integrating technology partners into co-creation, pilot implementation and iterative refinement processes, the project enables SMEs to validate their solutions in real care environments. This strengthens the innovation ecosystem by linking clinical needs with scalable technological solutions and supports the transfer of project results into market-ready applications.

It is also clearly differentiated from the earlier rehabilitation concept. The emphasis here is not primarily on surgery-specific rehabilitation or SME roadmaps, but on a blended home-therapy support model, provider adoption and patient-centred implementation shaped by the lessons learned across the uploaded VReduMED documents.

2.3.14.2. Example patient and therapist journey

A realistic patient journey starts with therapist selection of a suitable pathway and a short supervised introduction. The patient tries the headset in a supported setting, learns how to start and stop a session, and receives a simple guide. Where useful, a family caregiver is included in the introduction. The first home sessions are intentionally short. At the next therapist contact point, the patient reflects on confidence, comfort and motivation, and the therapist decides whether to continue, simplify or stop VR-supported use.

This design reflects the lesson that adoption depends on structured first contact and guided integration rather than a technology handover alone. It also helps keep patient safety and therapist ownership visible throughout the pathway.

2.3.14.3. Education, workforce and transfer value

The concept has value beyond patient support. It also creates a practical learning field for therapy education and continuing professional development. Educators can use the project materials to teach blended rehabilitation design, home-based patient support, digital communication with caregivers and realistic criteria for choosing when immersive support adds value.

Regional therapy schools, universities and CPD providers can therefore become important transfer partners. This follows the VReduMED logic that new technologies spread more sustainably when educational institutions, practice providers and intermediary organisations learn together rather than in parallel.

2.3.14.4. Indicative timeline and continuation route

In the first project period, partners identify suitable pathways, co-design the onboarding model and adapt the initial content.

The middle period runs therapist training and patient pilots in several waves.

The final period consolidates the provider handbook, public transfer materials, replication workshops and the post-project forum or exchange network.

The continuation route is deliberately light-touch. Providers should be able to start with a small number of kits and selected pathways before deciding whether larger-scale service integration is justified. This makes the concept credible for both funders and providers.

2.3.14.5. Practical therapy pathway examples

A useful project proposal should illustrate where the concept is likely to work best. Suitable examples include guided mobility routines where repetition and confidence matter, balance-related routines where therapist framing reduces anxiety, and shoulder or knee pathways where motivation often drops between supervised sessions. Each chosen pathway should be validated against safety, clarity and home feasibility criteria before entering the pilot.

The project should also document where VR is not the right choice. This negative evidence is valuable. It protects providers from unrealistic expectations and makes the final transfer package more credible.

2.3.14.6. Example use-case matrix

Pathway example	Potential benefit from VR support	Boundary condition
Mobility restoration	higher engagement during repetition	must stay within safe movement limits
Balance confidence	reduced uncertainty and stronger motivation	requires careful screening and therapist judgement
Upper-limb exercise adherence	clear pacing and more attractive repetition	content must remain simple and precise
General deconditioning recovery	supports confidence to resume routine activity	should complement, not replace, therapist contact
Caregiver-assisted home routine	shared instructions and encouragement	caregiver role must stay manageable

This annex helps position the project as a serious blended-care innovation rather than a technology showcase. It demonstrates that the consortium can distinguish clearly between appropriate and inappropriate use cases.

3. Low threshold VR prototyping for care education

The following section presents 360° VR learning scenarios that were created during the organised hackathon pilot activity. Each scenario was designed to address a concrete learning need in nursing education and demonstrates how immersive 360° environments can support the acquisition of procedural, communicative, and clinical reasoning skills. The examples illustrate how VR can translate real-world care situations into accessible, safe and repeatable learning experiences.

3.1. Technical Solutions

3.1.1. PaneoVR

PaneoVR was used as the primary authoring tool for creating VR training scenarios. The platform is a web-based toolkit specifically designed for the development of immersive 360° VR learning environments and focuses on easy accessibility and intuitive handling. The web editor allows users to design and structure scenarios visually, without requiring any programming knowledge. Content is created by combining 360° photos or videos with text elements, audio recordings, and interactive components directly within the editor.

All scenario content was produced by the participants themselves. Using 360° cameras, the teams captured authentic practice environments, procedural workflows, and simulated care situations. This approach offers several advantages: greater realism and authenticity, direct content control by subject matter experts, independence from external production providers, and a more cost and resource efficient development process.

Interactive elements such as hotspots, multiple choice questions, navigational markers, and checklists can be added via drag and drop. Scene transitions are easy to configure, ensuring clear structure and intuitive navigation within the VR environment. The finalized scenarios can be accessed through universal player applications on VR headsets, tablets, or desktop devices without requiring additional exporting or technical compilation steps.

PaneoVR supports major VR headsets and standard devices while relying on 360° video material as its primary visual foundation. This eliminates the need for complex 3D modeling or specialized programming work and significantly lowers the barrier for teaching teams who wish to produce or adapt VR training content on their own.

3.2. Developed 360° VR scenarios

3.2.1. Scenario 1: Hand disinfection

This 360° VR scenario demonstrates the correct procedure for hygienic hand disinfection according to evidence based standards. Recorded in a real care environment, the scenario embeds the individual steps within an authentic clinical context. Interactive hotspots provide information on indications, exposure times, common mistakes, and decision making moments. The aim of the scenario is to strengthen procedural confidence and raise awareness for infection prevention in everyday clinical practice.

Figure 6: "Hygienic Hand Sanitization" scenario developed during the hackathon using PaneoVR, showing five indications for hand disinfection. (photo: OTH Regensburg)

3.2.2. Scenario 2: Pain management

This scenario focuses on the assessment and management of a patient experiencing postoperative pain. The case involves a patient recovering from a tibia fracture who reports undefined and increasing abdominal discomfort. Learners are guided to select the appropriate pain assessment tool and perform the necessary steps to respond correctly to the situation. The scenario emphasizes clinical reasoning, structured assessment, and confidence in handling pain related cases in a realistic care environment.

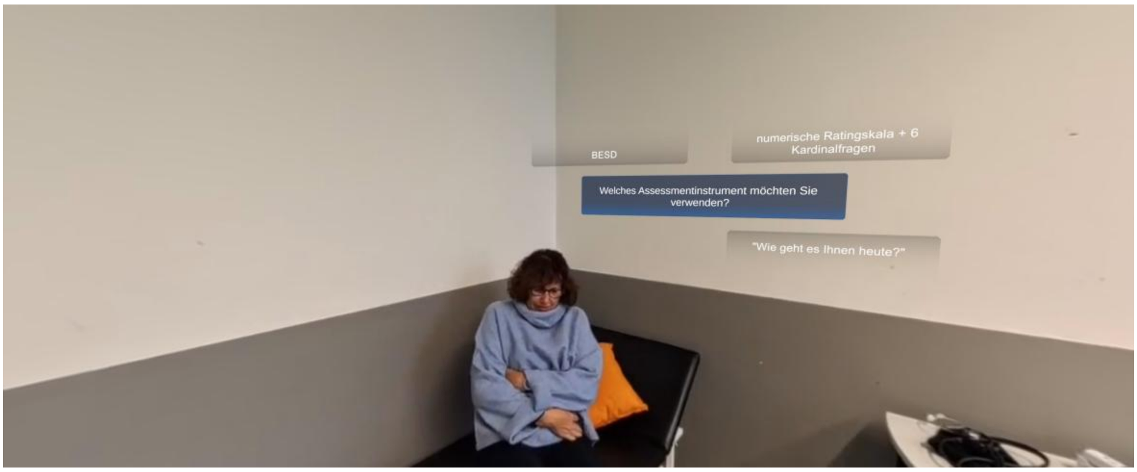

Figure 7: "Pain Management" scenario developed during the hackathon using PaneoVR, showing questions for pain assessment of patients. (photo: OTH Regensburg)

3.2.3. Scenario 3: Manual Blood pressure measurement

This 360° VR scenario teaches the correct procedure for manual blood pressure measurement, including guiding a family member through the process. The scenario covers preparation, selection of materials, patient positioning, correct cuff placement, auscultation, and interpretation of the readings. Interactive elements highlight potential pitfalls and guide learners through each step of the process. The goal is to strengthen methodological accuracy and support standardized performance in practical training settings.

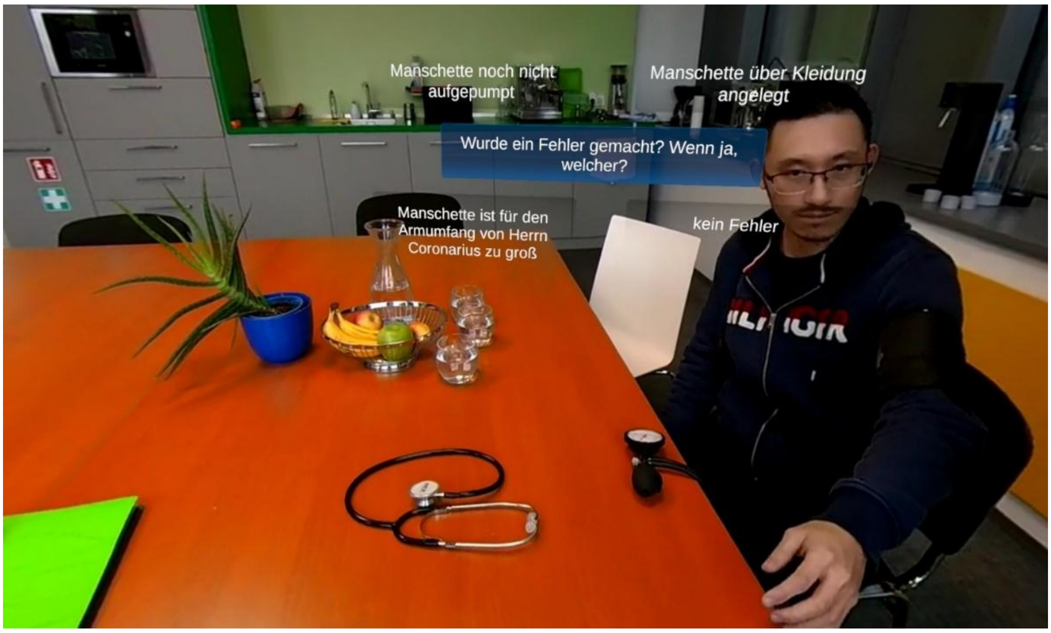

Figure 8: "Pain Management" scenario developed during the hackathon using PaneoVR, asking the user if an error was made during manual blood pressure measurement (photo: OTH Regensburg)

3.3. Sustainability & Long-term perspective

A key aspect of the development approach was ensuring that the results of the hackathon could be used, adapted, and further developed beyond the event itself. The goal was not only to create three prototype VR scenarios, but also to enable participants and educational institutions to continue working with the materials independently.

- Open availability: All applications created during the hackathon were made fully available to participants after the event. This unrestricted access ensures that teams can continue experimenting with the scenarios, integrate them into training sessions, or use them as reference material for future developments.
- Potential for further development: Because the scenarios were built using an accessible, low threshold authoring tool, participants are able to maintain and further develop the content without external support. Institutions can adapt the scenarios to fit their own teaching contexts, update them according to instructional needs, or expand them with additional scenes and interactions. This flexibility removes licensing or technical barriers and supports long term integration into nursing education programs.
- Resource efficiency: Using a user friendly authoring tool such as PaneoVR strengthens the reusability of learning materials and significantly reduces the entry threshold for new teams or institutions. Since no specialized programming knowledge or complex 3D asset creation is required, educational organizations can produce their own 360° content with minimal resources. This increases both scalability and sustainability, allowing immersive learning materials to be developed and maintained in a cost effective way.

4. Conclusion

The concepts presented in this document reflect a comprehensive and collaborative development pathway that integrated stakeholder perspectives, partner expertise and practical testing. The regional workshops provided diverse, practice-oriented ideas and highlighted what educators and care professionals expect from VR-supported learning. Consortium workshops transformed these inputs into clearly defined and jointly prioritized concept themes. Pilot activities confirmed the feasibility of cross-regional collaboration, validated VR-based working formats and demonstrated how interdisciplinary teams can create complete immersive learning scenarios using accessible tools.

Together, these elements resulted in three realistic and forward-looking concepts that represent strong candidates for future transnational projects in care education. They address communication challenges, workforce resilience and support for home-based rehabilitation—areas of high relevance across European healthcare systems. By documenting the development process and the concept outlines, this output contributes to long-term capacity building within the VReduMED network and provides a concrete basis for future implementation, transfer and scale-up activities

5. Appendices

5.1. Open Innovation Ideas generated from stakeholders

Topic	Idea	Description
First aid training	First Aid Model Situations in VR	Simulation of first aid scenarios that would be hard to train in real life
Anatomy/ Physiology training	3D observation of healthy human body functions	Learning about the structure and functioning of the human body in an intuitive, vivid and explorative way.
Anatomy/ Physiology training	VR Autopsy and Observation of Pathological Changes in Body Structures Caused by Different Diseases	To allow for vivid experience of pathological changes in humans and their comparison to healthy structures, without the need of real bodies.
Medical procedure training	VR Training for Performing Various Procedures and Examinations	To learn to carry out standard medical / care procedures such as blood collection, injections, endoscopy etc.)
Large scale disaster training	Mass Accident Simulation and VR Training for Patient Sorting	Mass accident scenarios would be very costly to train in reality. Focus is on sorting patients according to injury severity and providing first aid.
Emergency training	Emergency Situations in a Hospital Ward	Training of emergency situations in a hospital environment; various scenarios; learn how to react properly
Patient interaction training	Managing an Aggressive Patient	Learning to deal with aggressive patients and adequately treating them; VR application provides „virtual“ patient and gives feedback
Medical training	VR Autopsy and Observation of Internal Organs	Perform an autopsy on a „virtual“ body to learn body structures and organs
Patient interaction training	VR Training for Communicating Serious Information	Learn to adequately convey serious information (e.g death of a relative) to patients in stressful situations; VR application gives feedback
Procedure training	Wound Management and Bandage Replacement	A „virtual“ wound is presented and can be treated over a period of time and the application of various wound management materials (bandages etc.) can be trained
Patient interaction training	V®alidation	Training of validation skills for health personnel. Training of interaction with dementia patients and solving of resulting situations.
Procedure training	PEG - Management	Training of handling, common complications and management of PEG-tube with patients.
Education training	Room of Horror	Care education students have to find prepared errors in a room

Medical training	Wound care	Getting to know and practicing the correct procedure
Patient training	Dementia	Dealing with dementia patients, communication and behaviour
Medical training	Stroke care	Recognizing a stroke, practicing the correct procedures, first aid
Medical training	Infusion training at different levels of difficulty	Preparation of the required utensils, disinfection, selection of the correct utensils, practicing the procedure
Patient training	Dealing with unfriendly / disgruntled patients	Preventive behaviour for avoidance, learning to react correctly, communication
Patient training	Depression	Recognizing depression, helpful communication
Medical training	Decubitus	Prevention and treatment of chronic wounds
Mental training	Finding a dead person	Correct behaviour, compliance with the legally required steps, processing the experience
Procedure training	Recognizing sources of danger	Raising awareness of potential sources of danger in home care
Equipment training	Instruction in devices	Getting to know new medical devices and their functionalities, e.g. dialysis
Medical training	Emergency care for newborns and children	Getting to know the special features of caring for babies and children
Environment simulation	Modelling of expensive, rare, risky … situations in VR	360° Stereo images of environments, students would otherwise not be able to visit
Diagnostic tool	3D vision improvement	3D segmentation of CT / MR images, surgical decision support
Patient related tool	Ideal environment	Patient is put into a relaxing VR environment during examinations
Environment simulation	Site visit	Allowing a virtual visit to a healthcare site without disturbing procedures
Patient related tool	Fear reducing training	Reducing (for example) fear of heights by VR based training
Environment simulation	Infrastructure modelling	To virtually explore large-scale infrastructure of healthcare facilities and learn to use available equipment
MedTech product development	Avatar	Human 3D avatar as a modelling tool for healthcare product designers.
Collaboration tool	Multidisciplinary discussions	A collaboration tool to foster multidisciplinary trainings, meetings etc. in virtual environments
Collaboration tool	Collaborative space	3D display of digitized medical samples in a customizable VR environment

Procedure training	Risk reduction	Tool to train risky procedures without harming a patient
Medical procedure experience	MRI VR simulation	Allow the medical personnel to experience a procedure (for example MRI scan) they will be preparing the patients for, in the logic of "training the trainer". The personnel can experience the procedures their selves and better prepare the parents (pre-treatment consultation).
Clinical reasoning training	Patient unable to describe his or her condition	Training application for medical personnel and students to train doctor visitations. Train to assess the current state of a patient based on several factors (documentation, blood pressure, temperature, overall feel, …)
Procedure training	Surgical technologist simulation	Practice the correct administration of instruments according to verbal cues, in the correct order. Mistakes must be identified, …
Emergency training	Unexpected emergency training	Aimed at stress response of medical personnel in situations they are not prepared for. During simple task, an emergency situation occurs and must be handled (diabetic shock, overdosing, bleeding, …).