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Successful transfer and adoption of Good Practices on digitally enabled integrated care across Europe, an implementation science approach

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Abstract

An integrated, people-centred approach is crucial to the development of health systems that can respond to emerging and varied upcoming health challenges. The transfer of best practices across European regions focused on digitally enabled integrated care is a promising approach, however, it is not a straightforward process. A scientific approach is essential to ensure that successful models can be expanded and sustained across diverse healthcare settings. The JADECARE approach successfully guided the design and deployment of 21 complex evidence-based practices that reached more than four million people. The process included a series of methods to enhance the implementation, monitoring, reporting and sustainability of the interventions and it consisted of five steps: (i) fragmentation of Good Practices, (ii) needs assessment of implementing sites, (iii) selection of Good Practices according to these needs (iv) adaptation of the selected Good Practices to local contexts and (v) deployment of the adapted interventions in implementation sites. JADECARE, based on implementation science theories, demonstrates that the transformative journey into digitally enabled integrated care through the replication of existing practices in new contexts is realistic.

Background

An integrated, people-centred approach, implying a continuum of coordinated care services (health and beyond) that consciously adopt individuals' and communities' perspectives and respect social preferences, is essential for developing health systems capable of responding to emerging and diverse health challenges. These include urbanization, the global shift towards unhealthy lifestyles, social determinants of health as triggers of health inequity, ageing populations, the dual burden of communicable and noncommunicable diseases, multi-morbidities, rising health care costs, disease outbreaks and other healthcare crises. [1]

The incorporation of technology into healthcare is essential to help deliver an integrated model of care, resulting in more cost effective, efficient, and higher quality systems. Digital solutions, such as virtual consultations, electronic health records, telemedicine, and mobile health applications, play a crucial role in supporting integrated care models. [2][3] Despite their potential, widespread implementation and upscaling of these solutions face significant challenges, including interoperability issues, data security concerns, lack of trust, disparities in access and use, and varying levels of digital literacy among healthcare providers and patients. [4][5]

In this context, the **J**oint **A**ction on implementation of **D**igitally **E**nabled integrated person-centred **CARE** (JADECARE), was launched under the 3rd Health Program of the European Commission. Designed to stimulate governments, academic and other non-profit organizations to join forces at the EU level, this Joint Action aimed at tackling problems shared by EU Member States. [6] JADECARE brought together 45 organizations from 16 EU countries to support the transfer of four evidence-based Good Practices -from the Basque Country, Catalonia, Germany, and Southern Denmark- selected by the Steering Group on Health Promotion and Prevention and Management of Non-Communicable Diseases of the European Commission, [7] to 21 healthcare systems (so called Adopting Sites) [8]. The dimensions assessed for the selection of the Good Practices (political and strategic relevance, comprehensiveness of intervention, ethical and equity aspects, effectiveness and efficiency, transferability to other contexts, and sustainability) align with the criteria used by the EU Public Health Best Practice Portal. [9]

The primary goal of JADECARE was to reinforce the capacity of health authorities to address health system transformation towards digitally enabled integrated person-centred care. However, achieving effective care integration in real-life settings demands a deep understanding of transformation processes and optimizing implementation strategies [10] to make them effective and context specific. [11] [12] [13]A scientific approach can help address the challenge of scaling out [14] digitally enabled integrated care in Europe and ensure successful models can be expanded and sustained across diverse settings. Implementation science can guide the scaling out process, providing methods that facilitate the effective translation of evidence-based interventions into routine practice. [15] [16] [17]

Based on implementation science, this study aims to facilitate the transfer of Good Practices on digitally enabled integrated care across heterogenous contexts in Europe to support health systems transform into sustainable and efficient organisations that can improve population health and provide high-quality care.

Methods

The JADECARE *Transfer and adoption process* guided the implementation of complex evidence-based practices in new contexts. It included a series of methods to facilitate the implementation and enhance the sustainability of the interventions. [8]The process consisted of five steps: (i) fragmentation of Good Practices into Core Features, (ii) needs assessment of Adopting Sites, (iii) selection of Good Practices to transfer according to these needs (iv) adaptation of the selected Good Practices to the needs of Adopting Sites and (v) deployment of the adapted intervention in Adopting Sites (Figure 1). Local working groups in the Adopting Sites (including policymakers, managers, clinical and nursing professionals, technology experts, and innovation promoters) led the *Transfer and adoption process*. These groups, which varied in size (4-14 people, with an average of 8), had the autonomy to invite additional stakeholders at different points in the process to broaden and complement perspectives. Consensus development strategies [18] were used in all five steps to reach collective agreements. Capacity building activities supported local working groups in spreading and up-scaling efforts. [19]

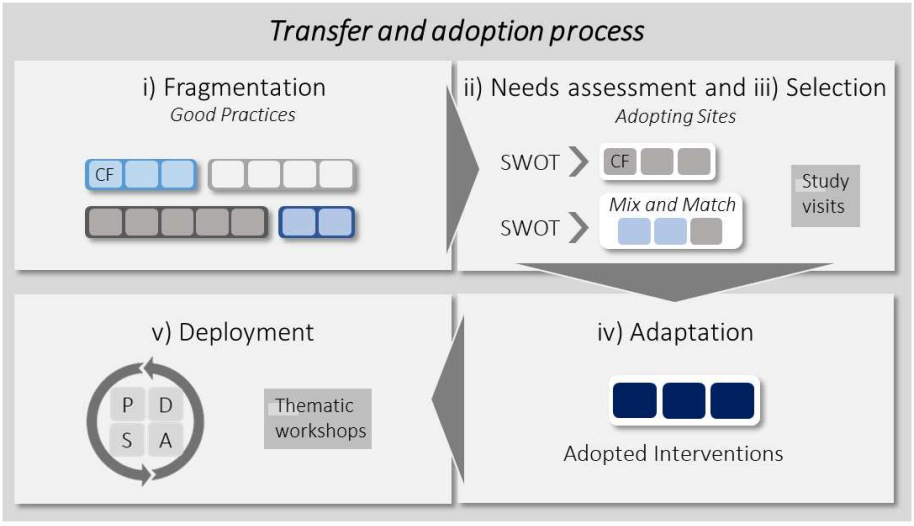


Figure 1: JADECARE *Transfer and adoption process*. The steps of the process are illustrated: fragmentation of Good Practices into Core Features (CF), identification of local needs using the SWOT analysis and selection of matching Core Features, design of interventions adapted to new contexts, and deployment, monitoring and reporting of interventions using continuous improvement cycles.

(i) Fragmentation

Studies of transfer, adaptation, and scale-up have confirmed that complex programmes or interventions are rarely replicated intact. [20] Instead, what is transferred are core units that maintain sufficient substance to achieve the expected outcome. For this reason, representatives with in-depth knowledge of each Good Practice were asked to break them down into smaller and more easily transferable components, referred to as Core Features (CFs). The identification

of these CFs was achieved through an expert consensus approach. Once defined, the CFs were grouped into high-level thematic blocks, each representing a major theme of the original Good Practices.

Additionally, the identified CFs aligned with the five dimensions depicted in the Framework on integrated, people-centred health services developed by the WHO [1] which provides orientation for health services to become more integrated and people-centred: "(I) engaging and empowering people and communities; (II) strengthening governance and accountability; (III) reorienting the model of care; (IV) coordinating services within and across sectors; and (V) creating an enabling environment".

(ii) Needs assessment

The Adopting Sites explored their healthcare needs regarding the transition to digitally enabled integrated person-centred care. For this purpose, local working groups conducted a situation analysis by means of a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis [21]. This approach allowed to reveal weaknesses and threats to be minimized, strengths and opportunities to build upon. The local working groups then categorized the identified needs into areas widely recognised as challenges to implementing integrated care in their specific setting. [22]

This situation analysis enabled local teams to share their vision and develop a shared understanding of the context, thereby laying a foundation for a culture of collaboration and consensus-building. Ultimately, it served to identify a set of intervention areas that guided the strategic action planning for the implementation efforts of the Adopting Sites.

(iii) Selection

Study visits were organized to provide an in-depth insight of the Good Practices, showcasing their implementation processes and impact in the original settings. These visits also highlighted potential facilitators and barriers that could influence the transferability of the practices to other contexts.

Based on this knowledge, the local working groups analysed the relationship between their healthcare needs -identified through the situation analysis- and the Core Features of the Good Practices. To facilitate this process, a correlation matrix was used to match Core Features with specific healthcare needs, ensuring alignment with available resources and the interests of the broader community, including policy makers. The correlation performed was based on the multi-criteria decision analysis methodology, assessing dimensions such as acceptability, feasibility, scalability, and sustainability. [23] Adopting Sites had the option to select Core Features from multiple Good Practices to best address their healthcare challenges (Mix and Match approach).

(iv) Adaptation

Local working groups constructed their practice, named Adopted Intervention, following concrete steps: (1) recognise local policies, strategies and interventions capable to address identified healthcare needs; (2) describe the target population and the intervention setting(s); (3) define the general aim and the expected outcomes; (4) determine components that build up

the Adopted Intervention tailored to the local context and needs; (5) recognize required resources (human, financial, organizational, technological); (6) construct the logic sequence of the implementation process [24]; and (7) pinpoint risks, constraints and dependencies that can influence the implementation and impact on the expected outcomes. These steps ensured building sustainable interventions that were grounded in existing health strategies and policy frameworks, fostering strong top-down and bottom-up connections.

(v) Deployment

The Adopted Interventions were rolled-out in the new contexts using Quality Improvement Models, namely Plan-Do-Study-Act (PDSA) cycles, which promote small-scale testing before taking changes system-wide. The PDSA cycle consists of four steps:

- PLAN: Identify and evaluate the resources needed to implement the Adopted Intervention.
- DO: Implement the intervention and collect data to track the process.
- STUDY: Analyse data obtained and compare the outcomes with the expected results.
- ACT: Refine and adjust the Adopted Intervention based on the lessons learned from the previous step.

Throughout the implementation, thematic workshops were held to bring visibility to the Adopting Sites, boost cooperation with local stakeholders and strengthen their sense of ownership over the Adopted Interventions. These workshops also served to assess the implementation progress, identify challenges and explore potential solutions. Representatives of the transferred Good Practices participated as expert advisors, providing guidance and support.

The deployment of the Adopted Interventions was thoroughly documented according to the SQUIRE 2.0 guidelines [25], which emphasize the relevance of reporting the entire implementation effort -planning, deployment and evaluation- while considering the specific context in which the intervention occurs.

Assessment of the Transfer and adoption process

The assessment of the *Transfer and adoption process* was conducted using a survey method targeting key stakeholders from the Adopting Sites and representatives of Good Practices (with the exception of Basque Country who led the development of the *Transfer and adoption process*). The survey included both custom-designed questions and standardized validated tests (Supplementary information 1. Survey for assessing the *Transfer and adoption process*). For each Adopting Site and Good Practice, one agreed response was requested.

The evaluation focused on two aspects. On one hand, the usefulness and the potential impact of the *Transfer and adoption process* in achieving implementation outcomes were assessed, the latter covering the categories described by Proctor [26]: appropriateness (perceived fit, benefit, and relevance of the practice for a given setting, or provider); feasibility (the extent to which a new practice can be successfully used within a given setting); fidelity (degree to which a practice was implemented as it was conceived originally); penetration (the integration of a practice within a service setting); and sustainability (the extent to which the implemented practice is

maintained or institutionalized). A self-created survey with eight questions was used to measure the usefulness and impact of the transfer and adoption approach in JADECARE.

On the other hand, the ten-item Implementation Strategy Usability Scale (ISUS) was utilized to evaluate the usability of the transfer and adoption methodology, including aspects such as consistency, coherence, ease of use and its contribution to the implementation effort. [27]

Results

Fragmentation

The four Good Practices transferred were fragmented into 55 Core Features and later grouped into 16 blocks (Table 1), to offer more easily transferable components to the Adopting Sites. According to the WHO Framework on integrated, people-centred health services, half of the CFs (49.1%) related to the reorientation of the model of care, aiming at more efficient and effective health care services, provided through innovative models that prioritize primary and community care services and the co-production of health. Some other CFs (36.36%) addressed the creation of enabling environments that promotes bringing together all stakeholders to undertake transformational changes, as such supporting the sustainability of deployed interventions. The least represented dimension (7.27%) was that of Coordinating services within and across sectors.

Good Practice		
Block	Core Feature	WHO
Basque health strategy in ageing and chronicity – integrated care (Basque Country)		
B1 Risk stratification	B1.1 Stratification data extraction and construction of dashboard	
	B1.2 Classification of patients according to health risks	
	B1.3 Stratification in the framework contract	
B2 Integrated care	B2.1 Creation of Integrated Healthcare Organizations	
	B2.2 Deployment of integrated ICT systems	
	B2.3 Care coordination between health providers	
B3 Patient empowerment	B3.1 Deployment of the School of Health	
	B3.2 Empowerment programmes for chronic patients	
Catalan Open Innovation Hub on ICT-Supported Integrated Care Services for Chronic Patients (Catalonia)		
C1 Population based health risk assessment	C1.1 Assessment of transferability of the risk stratification tool	
	C1.2 Health data management strategies	
	C1.3 Development of enhanced risk prediction modelling for health policy and clinical decision making	
C2 Promotion of healthy lifestyle	C2.1 Transferability of the prehabilitation programme	
	C2.2 Perioperative care with a population-health approach	
	C2.3 Rehabilitation of chronic patients	
C3 Vertical and Horizontal integration	C3.1 Programme for chronic and frail patients	
	C3.2 Complex case management	
	C3.3 Healthcare support programmes for nursing homes	
	C3.4 Integrated Care for subacute and frail patients	
	C4.1 Health Plans and Programs	
	C4.2 Regulation associated with patient' self-tracking data	

C4 Innovative assessment and regulation	C4.3 Regulation of health data management for research	
C5 Digital support of integrated care services	C5.1 Regional information exchange platform	
	C5.2 Primary Care electronic Medical Record and e-Prescription	
	C5.3 Personal Health Folder	
	C5.4 Adaptive case management and collaborative work	
	C5.5 Cloud-based strategies	
The OptiMedis Model – Population based integrated care (Germany)		
O1 Shared savings contract	O1.1 Contractual arrangements and value-based contracting	
	O1.2 Data standards and appropriate outcome measures	
	O1.3 Design of valued-based payment framework	
	O1.4 Analytical model for contract execution	
O2 Model for strong stakeholder engagement	O2.1 Identification of and liaison with stakeholder groups	
	O2.2 Creation of appropriate governance structures	
O3 Electronic integration across providers	O3.1 Assessment of health IT integration and IT tools in use	
	O3.2 Market assessment on tools for IT connectivity of providers	
	O3.3 Training on incentives for IT deployment assessment	
	O3.4 Patient access to their data (Open Notes approach)	
O4 Patient involvement and empowerment	O4.1 Patient advisory boards	
	O4.2 Shared decision-making tools and self-management support	
	O4.3 Comprehensive health checks and health-related goals	
	O4.4 Training on incentives to implement patient-centred care	
O5 Data-driven management	O5.1 Potential analysis tool	
	O5.2 Performance dashboards	
	O5.3 Tool to identify over- and underutilization of prescriptions	
O6 Prevention, health promotion and public health	O6.1 Individual treatment plans and care programmes	
	O6.2 Care planning based on Chronic Care Model	
	O6.3 Patient coaching	
Digital roadmap towards an integrated health care sector (Southern Denmark)		
S1 Cross sectorial digital communication	S1.1 Health Agreements	
	S1.2 Messaging Standards	
	S1.3 Cooperative Agreement among healthcare actors	
S2 Cross sectorial digital communication	S2.1 Tele-COPD	
	S2.2 Tele-psychiatry	
	S2.3 My Patient Journey	
	S2.4 Online physical rehabilitation	
	S2.5 Digital Health Centre	
	S2.6 Geri Toolbox	

Table 1: Fragmentation of Good Practices. The Good Practices (B: Basque Country; C: Catalonia; O: Optimedis model; S: South Denmark) were broken down into Blocks (column on the left) and Core Features (column in the middle), the latter being associated to the strategies of the Framework on Integrated people-centred health developed by the WHO (Engaging and empowering people and communities , Strengthening governance and accountability , Reorienting the model of care , Coordinating services within and across sectors , and Creating an enabling environment) (column on the right).

Needs assessment and Selection

The Adopting Sites identified, grouped and prioritized their healthcare needs (Table 2). Most of them were related to care coordination and continuity of care (26.47%) or integration and interoperability of IT services (17.65%), whereas others concerned patient empowerment (13.24%). Fewer needs addressed issues associated to governance, coverage and accountability (10.29%)[28]. (Supplementary information 2. Assessment of healthcare needs of the Adopting Sites.)

Based on this analysis, the Adopting Sites aligned their specific healthcare needs with the CFs of the Good Practices. Most Adopting Sites (17 out of 21) selected CFs from a single Good Practice while four sites adopted the Mix and Match approach (Croatia, Czech Republic, Denmark and Estonia), selecting CFs from multiple Good Practices. Complete detail of the CFs selected by the Adopting Sites can be found in Table 1.

Adopting Site					
Healthcare needs	Core Features aligned with the needs				
German Speaking Community in Belgium (Be)					
- Lack of qualified health personnel - Difficult access to health data for disease management - Hardly connected care provision across healthcare levels - Payment framework not oriented to value creation	O1.1 O1.2 O1.3 O1.4	O2.1 O2.2 O3.1 O3.2	O3.3 O3.4 O4.1 O4.2	O4.3 O4.4 O5.1 O5.2	O5.3O 6.1O6 .2 O6.3
Croatian Institute of Public Health (Cr)*					
- Lack of personalized interventions for complex patients - Sparse self-management capacity of patients - Insufficient communication between patients and healthcare providers				B2.2 B3.1 B3.2	S1.1 S1.2 S1.3 S2.5
University Hospital Olomouc (Cz)*					
- Low accessibility of patients in remote areas to healthcare services - Scarce coordination between health and social sectors - Poor health literacy level of chronic patients and caregivers - Unavailability of health records to patients					B2.3 S2.2
North Denmark Region (Dk)*					
- Low predictability of health status deterioration in chronic patients - Non-tailored healthcare interventions - Deficient use of and access to health data by healthcare professionals				B1.1 B1.2 B1.3	O5.1 O5.2
Viljandi General Hospital (Es)*					
- Absence of patients´ needs profiling at population level - Lack of reimbursement models for care integration promotion - Powerless cooperation between health and social fields				C1.1 C1.2	O1.1 O1.3 O1.4
Eurometropole of Strasbourg (Fr)					

- Undefined local health ecosystem	O1.2	O2.2	O4.3	O6.1
- Weak engagement of key stakeholders in integrated care	O1.3	O3.1	O4.4	O6.2
- Uncoordinated care provision in care transitions	O1.4	O3.3	O5.1	O6.3
- Unsustainable funding schemes	O2.1	O4.2	O5.2	
Aristotle University of Thessaloniki (Gr)				
- Late identification of chronic patients at risk				B1.2
- Little self-care skills of chronic patients and caregivers				B3.1
- High-rate chronic patients with overmedicalization				B3.2
- Weak intersectoral coordination in transitional care				
Jahn Ferenc South-Pest Hospital and Clinic (Hu)				
- Siloed care provision in the rehabilitation field			C1.3	C3.2
- Low digital literacy among healthcare professionals			C2.3	C3.4
- Passive attitude of patients and citizens in preventive care			C3.1	C5.4
Health Regional Agency of Tuscany Region (It)				
- Reactive healthcare system to chronic patients´ needs				B1.1
- Considerable fragmentation in care provision				B1.2
- Inefficient resource allocation				B2.3
United Local Health Authority Umbria (It)				
- Underused remote monitoring of chronic patients				B2.2
- Not enough coordination between healthcare providers				B2.3
- Suboptimal empowerment level of patients				B3.2
- Improvable community care and public health approach				
Marche Region (It)				
- Large proportion of chronic patients off the radar of health system				C1.1
- Poor cross-connectivity between health information systems				C1.2
- Non-existent data-driven support for healthcare services and policies				C1.3
ASL Napoli 2 Nord (It)				
- Unclear definition of care pathway for frail people			C3.1	C5.1
- Non-optimal home care provision			C3.2	C5.2
- Limited support to patients and caregivers for self-management			C3.4	C5.4
Lombardy region (It)				
- Low coverage of health needs of specific populations				S2.2
- Inequity in access to digital services and tools				S2.4
Children's Clinical University Hospital (La)				
- Underdeveloped digital solutions for delivery of integrated care	S1.1		S2.1	S2.4
- Low acceptance of new technology from end-users	S1.2		S2.2	S2.6
- Absence of interoperability of information systems at national level	S1.3		S2.3	
Central Administration of the Health System of Portugal (Pt)				
- Lack of risk-adjusted care provision and financing			B1.1	B2.2
- Unresolved continuity of care between healthcare settings			B1.2	B2.3
- Uneven access to health data by professionals and patients			B1.3	

Ministry of Health of the Republic of Serbia (Sr)		
- Non-systematic identification of multimorbid patients		B2.2
- Non-effective clinical pathways for multimorbid patients		B3.1
Health Insurance Institute of Slovenia (Sl)		
- Unclear criteria and procedures for patient referral across settings	O1.1	O2.1
- Insufficient educational level of patients for self-care	O1.2	O3.1
- Old-fashioned payment models not adapted to current scenarios	O1.3	O3.2
	O1.4	O6.3
Regional Health Service of Castilla y Leon (Sp)		
- Limited resources to ensure continuity of care		S1.1
- Unwell interconnected information systems in healthcare		S2.2
- High digital divide among healthcare professionals and citizens		S2.6
Regional Health Service of Cantabria (Sp)		
- Significant gap in the coordination between social and health services		S2.2
- Deficient personalization of delivered healthcare		S2.4
- Unsatisfactory level of treatment adherence by chronic patients		S2.5
Regional Ministry of Health and Consumers Affairs of Andalusia (Sp)		
- Weakened home care including palliative approach		S2.1
- Non-systematic and incomplete assessment model for integrated care		S2.6
- Little cooperation between health and social care providers		
- Poorly skilled professionals and patients in digital tools use		
Regional Health Service of Murcia (Sp)		
- Lack of individualized planning in the rehabilitation services		S2.4
- Scant multidisciplinary in the professional teams		S2.5
- Unknown extent of the digital divide in older patients		

Table 2: Assessment of healthcare needs of the Adopting Sites. The needs (column on the left) prioritized by each Adopting Site are shown and the specific Core Features of the Good Practices (columns on the right) that address the corresponding needs (B: Basque Country; C: Catalonia; O: Optimedis model; S: South Denmark). The asterisks refer to Adopting Sites that followed the Mix and Match approach, that is, adopting CFs from more than one Good Practice.

Adaptation and deployment

Twenty-one new technology-facilitated Adopted Interventions were built. Three Adopted Interventions (14.29%) from Croatia, Portugal and Serbia were implemented at the national level, whereas the majority (66.67%) were deployed at regional level, including Belgium, Denmark, Czech Republic, France, Greece, Italy, Slovenia and Spain (Andalusia, Cantabria and Castilla y Leon). Four Adopting Sites (19.05%) from Estonia, Hungary, Latvia and Spain (Murcia) achieved an impact at local level. Although the practices differ from each other, all of them supported the transformation of health systems towards digitally enabled integrated care by addressing context-specific challenges.

The implementation of the Adopted Interventions reached over 4 million people across Europe. Among these, four Adopting Sites (Portugal, Italy -Marche Region and Lombardy Region- and

Spain-Castilla y Leon) impacted more than half million people. Four (Belgium, Latvia, Serbia and Spain-Cantabria) reached between 50,000 and 500,000 people, while seven (Denmark, Greece, Hungary, Italy, Slovenia, Spain-Andalusia and Murcia) targeted between 1,000 and 10,000 people. A brief description of the 21 Adopted Interventions is provided below.

German Speaking Community in Belgium (Be) analysed morbidity prevalence and chronic care distribution, as well as the potential to reduce ambulatory care sensitive hospital cases using routine data. This laid the groundwork for policy dialogue to reorient care towards Population Health Management and Value Based Health Care.

Croatian Institute of Public Health (Cr) advanced digital transformation by improving digital communication between healthcare professionals and patients. They promoted the central e-health portal and a health-education webpage through a co-creation process with patients to improve health outcomes, empower patients in disease management and connect primary and specialized care.

University Hospital Olomouc (Cz) introduced video consultations in psychiatry, now used by most health insurers, with potential for other clinics. This led to services like gestational diabetes and teleophthalmology which use dashboards for sharing documentation and communication. An Integration Server was built to exchange data for telemedicine and mobile Health applications, aiming to centrally record invasive admissions regionally.

North Denmark Region (Dk) laid the foundation for strategic data use in diabetes care, building on dashboards for risk stratification of patients that miss medical appointments. A network of 17 regional policy departments, clinical units and research institutes was formed to discuss on the population health approach.

Viljandi General Hospital (Es) enhanced local data quality to develop a risk stratification pyramid supporting integrated care planning. An ambitious 2022-2025 protocol was elaborated to explore value generation of continuous healthcare and social services, approved by the Estonian Health Insurance Fund.

Eurometropole of Strasbourg (Fr) established a population based integrated care system in three districts. Major chronic diseases' distribution was analysed using routine health data to identify high-risk and underserved areas. The impact of preventive care (e.g., sports on prescription) on consumption of healthcare resources was assessed to inform integrated care planning.

Aristotle University of Thessaloniki (Gr) developed a mobile app with virtual patient scenarios and a virtual reality application for healthcare professionals to enhance empathy. Risk classification algorithms and a roadmap for national implementation of risk stratification were also created.

Jahn Ferenc South-Pest Hospital and Clinic (Hu) designed and implemented a national strategy to improve diabetic foot prevention through digitally supported care. This included patient pathways, an indicator system for general practitioners (GPs), established care teams and collaboration across stakeholders. A two-step training programme for GPs and nurses was implemented, including educational materials for patients.

Health Regional Agency of Tuscany Region (It) created a care model for complex patients to improve communication, coordination between healthcare professionals and also between territorial and hospital services.

United Local Health Authority Umbria (It) improved communication between healthcare professionals and accelerated bookings by creating a direct GP-cardiologist channel. Healthcare professionals were trained in empowering heart failure patients.

Marche Region (It) implemented risk stratification module in their context, learned on regional Health Administrative Databases, developed semi-automated data procedures, structured dashboards to visualize stratification and health indicators, and analysed service use and costs by complexity and morbidity groups.

ASL Napoli 2 Nord (It) launched a protocol for home-based care of frail patients and transitional care after hospital discharges. A technological platform was integrated with municipal social services through interoperability with hospital systems (vertical and horizontal integration).

Lombardy region (It) improved access to psychiatric and rehabilitation services for remote users via telepsychiatry, supporting those reluctant to attend in person.

Children's Clinical University Hospital (La) drafted a telemedicine-based digitization strategy focused on sustainable, integrated, person-centred care.

Central Administration of the Health System of Portugal (Pt) advanced a population-based model with risk stratification, risk adjusted financing, increased access and quality of care, and care pathways incorporating patient perspectives, focusing on the sustainability of the system.

Ministry of Health of the Republic of Serbia (Sr) integrated consultations for diabetes into local electronic health record systems. Healthcare staff was trained, personal data protection assessed, and a mobile app linked to the e-health portal was developed to empower patients.

Health Insurance Institute of Slovenia (Sl) defined screening criteria with nephrology and primary care specialists, created and distributed educational materials for patient empowerment, and adjusted payment models to incentivize integrated care.

Regional Health Service of Castilla y Leon (Sp) improved communication using digital tools, scaling up teledermatology and teleconsultation for complex chronic patients, alongside structured training for healthcare professionals focused on management of complex chronic patients living in rural areas.

Regional Health Service of Cantabria (Sp) developed video-based rehabilitation and geriatric telepsychiatry programmes. The School of Health was launched offering videos on early disease detection, emergency protocols for cardiorespiratory arrest, physical activity and nutrition.

Regional Ministry of Health and Consumers Affairs of Andalusia (Sp) enhanced home care via a centralized system integrating homecare data with IT systems for proactive and remote monitoring, identification of early warning signs, adaptation of prescriptions, and caregiver support.

Regional Health Service of Murcia (Sp) developed an online rehabilitation programme including integrated treatment protocols, pain assessment tools, and videos for chronic conditions, fully interoperable with the corporative *Patient circle* platform.

Assessment of the Transfer and adoption process

The 21 Adopting Sites and representatives of the three Good Practices (with the Basque Country excluded since it led the development of the transfer and adoption methodology) were invited to assess various spheres of the *Transfer and Adoption process* deployed in JADECARE (N=24). Responses were collected (Table 3) from 19 out of the 21 Adopting Sites, excluding Napoli and Serbia, and the three Good Practices (Catalonia, Germany, Denmark) (95.6%).

Usefulness of the *Transfer and adoption process*					
I think that it has helped to…	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-plan and implement the Adopted Interventions	0%	0%	4.55%	50%	45.45%
-detect problems, bottlenecks and/or deviations	0%	0%	13.64%	40.91%	45.45%
-define and implement mitigation actions	0%	0%	22.73%	50%	27.27%
Impact of the *Transfer and adoption process*					
I think that it has helped to…	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-design an appropriate intervention (relevant, compatible, aligned and fit to local needs)	0%	4.55%	0%	50%	45.45%
-design a feasible intervention (high probability to be successfully used or carried out within a given setting)	0%	4.55%	13.64%	45.45%	36.36%
-implement the intervention as it was conceived originally or as it was intended	0%	9.09%	13.64%	59.09%	18.18%
-implement an intervention highly integrated within the local service setting	0%	4.55%	27.27%	45.45%	22.73%
-implement a sustainable intervention (high probability to be maintained or institutionalized within a service setting)	0%	0%	18.18%	54.55%	27.27%
Usability of the *Transfer and adoption process*					
through positive reinforcing	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-I think that I would like to use it frequently	0%	0%	18.18%	45.45%	36.36%

-I thought it was easy to use	0%	4.55%	27.27%	63.64%	4.55%
-I found the various components very well integrated	0%	0%	22.73%	72.73%	4.55%
-I would imagine that most people would learn to use it very quickly	4.55%	9.09%	40.91%	45.45%	0%
-I felt very confident using it	0%	4.55%	31.82%	59.09%	4,55%
through negative reinforcing	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
-I found it unnecessarily complex	13.64%	50%	22.73%	13.64%	0%
-I think that I would need the support of a technical person to be able to use it	4.55%	36.36%	31.82%	27.27%	0%
-I thought there was too much inconsistency in it	22.73%	63.64%	13.64%	0%	0%
-I found it very cumbersome to use	9.09%	54.55%	22.73%	13.64%	0%
-I needed to learn a lot of things before I could get going with it	4.55%	36.36%	22.73%	27.27%	9.09%

Table 3: Assessment of the *Transfer and adoption process*. Usefulness, impact and usability of the methodology is evaluated. The percentage of the participants per response type (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) of the combined survey are presented.

The vast majority of the respondents considered that the *Transfer and adoption process* helped to plan and implement the Adopted Interventions (95.45%), to detect problems, bottlenecks or deviations (86.36%), and to apply mitigation actions (77.27%). No one believed that the methodology was not useful according to the questions posed.

Nearly all respondents perceived that the *Transfer and adoption process* had a positive impact in the design of an appropriate (95.45%), feasible (81.82%), and sustainable (81.82%) intervention. Fewer considered that the implementation methodology facilitated the integration of the intervention into the local service setting (68.18%).

Regarding the usability, perceptions varied greatly. The willingness to use the methodology frequently and the integration between its various components were widely agreed aspects (81.82% and 77.27%, respectively) and the question about its inconsistency was rejected by most of the respondents (86.36%). Nonetheless, some of respondents (36.36%) acknowledged that they needed learning before start using the methodology and some others (27.27%) considered that they would need expert support to use it.

Discussion

This work showcases the Joint Action JADECARE as a successful example for transferring complex and evidence-based practices across European countries, facilitating the transition of healthcare systems towards digitally enabled integrated person-centred care. The translation of the implementation science knowledge into pragmatic and usable guidelines for non-experts in the

field contributed significantly to the success of the transfer experience among heterogeneous contexts. [29][30][31]

Several studies describe different whole system transformation initiatives and they are mainly based on key principles: “comprehensive services across the care continuum, patient focus, geographic coverage and rostering, standardized care delivery through interprofessional teams, performance management, information systems, organisational culture and leadership, governance structure, and financial management” [32][33][34]. The Good Practices and Core Features presented in this article address healthcare system reform principles, providing specific mechanisms to support the effective and sustainable implementation of integrated person-centred care.

Complex adaptive systems are characterized by a high degree of interrelatedness, the decomposability of components, and the occurrence of unintended outcomes [35]. Acknowledging health systems as complex adaptive systems, the transferability of best practices [36] requires the systematic consideration of the primary and target context and needs, and preferences of diverse populations. The new practice will not be a replica of the original but a translation into the new setting, resulting in different interventions that aim to achieve similar objectives. Reflecting on the content matter can help selecting key elements of best practices and tailoring them to new contexts, as done in JADECARE, aligning proposed intervention to local needs, overcoming resistance to change and enhancing the buy-in. [37][38] By reaching the tipping point [39] , where new practices are widely accepted, successful and sustainable adoption, implementation and roll-out of the practice in real settings is more attainable.

It is well recognized that an active and purposive approach is required to translate research findings or evidence into routine clinical care. The tension between rigor and relevance is at the centre of two conversations in implementation research. One conversation focuses on traditional scientific principle, emphasizing rigorous research while incorporating usability and applicability across diverse real-world contexts. The other pertains to real-world programs, settings, and populations, which must acknowledge that rigorous evaluation and scientific fundamentals, along with necessary effort and planning, are essential. [40][41] The implementation approach proposed and applied in JADECARE, perceived as useful and usable by implementers, embeds both perspectives equally and well-balanced, operationalised via pragmatic learning cycles that ensure fit-for-purpose interventions are developed and adopted at real-system level. [42][43] Additionally, the reporting of the implementation of Adopted Interventions based on emerging standards [44] [45] [46] has been performed to permit replication.

There are some limitations to this study. First, the Adopting Sites were free to select the stakeholders to be approached. Consequently, the composition of the Local working groups varied significantly. Emphasis on strategies to engage key stakeholders and increase their participation is required to ensure sharing power in the decision-making processes, including the perspectives and skills of all involved, respecting and valuing the knowledge of all, and reciprocity. [47] [48] Second, the result of the practice transfer has been presented by outlining the characteristics of the Adopted Interventions, which are based on the selection of Core Features that best fit the perceived healthcare needs. Measurement of the effectiveness of the interventions in the target contexts remains to be investigated in the future. Third, the scope of

the implementations is determined from a self-reported qualitative perspective (local working group), rather than through a strict quantitative approach. Frameworks for process evaluation [49], as well as mixed methods [50] and transdisciplinary approaches, are envisioned to accurately assess impact of implemented practices. Finally, JADECARE has triggered the transformation of health systems towards digitally enabled integrated care in several regions in Europe; however, the long-term sustainment of this transformation is not secured.

Conclusions

The JADECARE experience demonstrates that the transformative journey into digitally enabled integrated care through the transfer of existing complex and evidence-based practices is realistic. Large scale deployment of data-driven, people-centred and proactive approaches promote moving from a one-size-fits-all scheme to targeted and tailored interventions. Learning from implementation science has led the transfer and adoption process, converting the theory-driven approach into pragmatic and easy-to-use sequenced steps. This has facilitated the implementation of interventions that are contextually adapted, appropriately integrated into service settings and sustainable over time.

Glossary

- Adopted Intervention: the practice designed and implemented by the Adopting Sites to address the local needs
- Core Feature: meaningful units that represent the minimum level to which Good Practices can be unpacked while maintaining sufficient substance to produce the expected impact on health.

Abbreviations

CF: Core Feature

GP: General practitioner

ICT: information and communication technologies

IT: Information technology

PDSA: Plan-Do-Study-Act

SWOT: Strengths-Weaknesses-Opportunities-Threats

WHO: World Health Organization

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and material

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

Y.H and A.F. wrote the main manuscript text. The data was retrieved from all the 21 healthcare systems (so called Adopting Sites) participating in the Joint Action JADECARE, that are represented by all the authors. All authors reviewed the manuscript, meaning U.A.; R.B.; N.B.; I.B.B.; A.M.C.; Z.D.; M.F.; M.F.; C.F-V.; C.F.; M.K.; I.L.; M.P.L.A.; R.P.; G.P.; P.P.L.; R.N.P-M.; C.P.; N.R.; V.R.; M.R.; J.R.; R.R-A.; K.S.; K.S.; D.T.; I.Z.; M.Z.; J.Z.; M.Z.; E.M.

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