BMJ Open

Resilience in Healthcare (RiH) - A Longitudinal Research Program Protocol

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-038779
Article Type:	Protocol
Date Submitted by the Author:	24-Mar-2020
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Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, QUALITATIVE RESEARCH

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Resilience in Healthcare (RiH) – A Longitudinal Research Program Protocol

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Keywords:

Resilience, Quality of Healthcare, Patient Safety, Longitudinal Studies, Interdisciplinary Research

ARTICLE SUMMARY

Introduction

Over the past three decades, extensive research has been undertaken to understand the elements of what constitutes high quality in healthcare. Yet, much of this research has been conducted on

individual elements and their specific challenges. Hence, goals other than understanding the complex of factors and elements that comprises quality in healthcare have been privileged. This lack of progress has led to the conclusion that existing approaches to research are not able to address the inherent complexity of healthcare systems as characterized by a significant degree of performance variability within and across system levels, and what makes them resilient. A shift is, therefore, necessary in such approaches. Resilience in Healthcare (RiH) adopts an approach comprising a comprehensive research program that models the capacity of healthcare systems and stakeholders to adapt to changes, variations and/or disruptions: i.e. resilience. As such, RiH offers a fresh approach capable of capturing and illuminating the complexity of healthcare and how high quality care can be understood and advanced.

Methods and analysis

Methodologically, to illuminate what constitutes quality in healthcare, it is necessary to go beyond single-site, case-based studies. Instead, there is a need to engage in multi-site, cross-national studies, and engage in long-term multidisciplinary collaboration between national and international researchers interacting with multiple healthcare stakeholders. By adopting such processes, multiple partners and a multi-disciplinary orientation, the five-year RiH research program aims to confront these challenges and accelerate current understandings about and approaches to researching healthcare quality.

The RIH research program adopts a longitudinal collaborative interactive design to capture and illuminate resilience as part of healthcare quality in different healthcare settings in Norway and in five other countries. It combines a meta-analysis of detailed empirical research in Norway with cross-country comparison from Australia, Japan, Netherlands, Switzerland, and the UK. Through establishing a RiH framework, the program will identify processes with outcomes that aim to capture how high-quality healthcare provisions are achieved. A collaborative learning framework centered on engagement aims to systematically translate research findings into practice through co-construction processes with partners and stakeholders.

Ethics and dissemination

The RiH research program is approved by the Norwegian Centre for Research Data (No. 864334). The empirical projects selected for inclusion in this longitudinal research program have been approved by the Norwegian Centre for Research Data or the Regional Committees for Medical and Health Research Ethics. The RIH research program has an embedded publication and dissemination strategy focusing on the progressive sharing of scientific knowledge, information and results, and on engaging with the public, including relevant patient and stakeholder representatives. The findings will be disseminated through scientific articles, PhD dissertations, presentations at national and international conferences, and through social media, newsletters, and the popular media.

Strengths and limitations of this study

- Moving beyond the individual case study approach and taking a longitudinal, multilevel, cross-case approach to explore the complexities of resilient adaptive capacities required for high quality healthcare.
- The 5-year longitudinal research program offering an integration of resilience theory, collaborative learning as well as patient and stakeholder involvement is enacted through a multi-disciplinary approach.
- Combining detailed empirical research in diverse healthcare settings in one country, with cross-country comparison of resilient adaptive capacities in six other countries as a basis for meta-analysis.

- A potential limitation is that the project duration of five years may not be sufficient to demonstrate how resilient adaptive capacities can improve healthcare quality by means of patient and stakeholder involvement and collaborative learning.

INTRODUCTON

Resilience in healthcare

Resilience in healthcare is central to what constitutes quality in healthcare provision. Defined by the proactive capacity that organizations, units, teams, and individuals enact to adapt to changes and potential challenges in everyday practices, rather than to resist them, resilience results in high quality care. This way of defining resilience is held to be comprehensible regardless of the healthcare system component or level under investigation. Resilience should, furthermore, be explored as a multi-level phenomenon with collaborative learning and stakeholder involvement as vital prerequisite pillars.[1] Stakeholders in healthcare are any person, group or organization who provides, receives, manages, regulates or pays for healthcare. As such, they involve patients, carers, healthcare professionals, managers, regulatory bodies, non-governmental organizations (NGOs), municipalities, regional authorities, etc.

Resilient healthcare is assumed to be underpinned by adaptive capacity in the healthcare system. It involves the use of internal (e.g. sense making, experience) and external resources (e.g. colleagues, networks, regulation) to adapt everyday functioning (e.g. adaptation of care processes as a result of variability in demand or time constraints), to successfully resolve challenging issues to continue to operate with a high level of quality.[2] In contrast to much existing research on healthcare quality, which tends to focus on healthcare failures,[3 4] resilience research is focused on capturing healthcare processes with successful outcomes to illuminate how high quality is generated across healthcare systems, organisations and, crucially, in everyday clinical work.[5] Evidence reported in sectors other than healthcare indicates that resilience comprises capacities such as flexibility, adjustments, improvisation, adaptation, and responding to variability.[6] These capacities are currently explored and partially acknowledged in the healthcare sector, but have to date been limited to small-scale individual case studies. Detailed, multi-site, multi-disciplinary and multi-level research is, therefore, needed to study resilience in healthcare over time and empirically in different clinical and system contexts.

Background and status of knowledge

Healthcare quality is a highly prioritised global health issue that involves the components of patient safety, continuity of care, patient-centeredness, effectiveness, equity, and efficiency.[7] Over the past three decades, extensive research has been undertaken to understand these quality components individually. However, many and perhaps most efforts are conducted in silos (i.e. mono-disciplinary, without crossing healthcare levels or organisational boundaries) and significant advancements have yet to be made. For example, surveys of patient experiences indicate that hospitals continue to score poorly regarding coordination, continuity of care, and patient-centeredness.[8 9] Furthermore, data consistently show that, internationally, the rate of harm due to healthcare-induced adverse events remains between 5-10% for hospitalized patients with some variation across countries.[10-14] Higher numbers are indicated for primary care patients[15] including, for example, medication administration-related adverse events at a range of 13-31 %.[16]

The relative consistency of these findings over time and in different geographical locations leads to the conclusion that many existing approaches to research that rely on a range of standardised methods (e.g. root cause analysis, checklists, handover protocols) are inadequate for understanding, facilitating and maintaining healthcare quality. Instead, poor healthcare quality is often related to the inherent complexity of healthcare systems, characterized by silos, multiple stakeholder interactions and a significant degree of performance variability within and across system levels.[3 4 17 18] A radical change is, therefore, necessary to understand the complexity of care processes, identify how resilience can be supported, and build an interdisciplinary theoretical and methodological approach that bridges the social sciences, the clinical field, and quality and safety research.[19]

Empirical research from across multiple healthcare settings is necessary to capture, illuminate, and, subsequently, support resilient adaptive capacities and processes across entire healthcare systems[18] (e.g. by informing the development of interventions to improve capacity for adaptive change).[20] However, apart from a small number of studies within specific clinical areas,[21] healthcare research conducted from a resilience perspective is still in its infancy.[22] Therefore, limited understandings are currently available to elucidate how resilience is manifest in different healthcare settings and how factors such as type and pace of clinical work or patient acuity affects the levels of resilience afforded by the healthcare system. Consequently, research is needed to systematically identify and subsequently test and evaluate concepts and interventions that promote resilience as a means to secure high quality healthcare in a variety of healthcare settings and contexts.[18]

Research challenges

The RiH research program aims to address six major research challenges related to resilience and its role in high quality healthcare. These are related to the current gaps in the literature concerning:

1. a comprehensive explanatory theory of resilience. Existing efforts to develop sound concepts and models of resilience lack extensive empirical testing.[23-25] Existing research also lacks theoretical integration of the multiple levels of the healthcare system, from individuals and teams (micro), to organisations (meso), to regulatory bodies and policy level actors (macro).
2. patient and stakeholder involvement (PSI) in studies of RiH,[26] despite persistent claims within the literature that patients, carers and other healthcare stakeholders are fundamental co-creators of resilience.[3 18 27-29] Addressing this shortcoming contains the need to develop appropriate procedures for patient and stakeholder involvement throughout the research process[30] which includes investigating how patients can contribute to resilience.
3. comprehensive methodological approaches to improve the validity, reliability, and efficiency of RiH research, innovative methods are required to identify and document adaptive capacities in a longitudinal perspective.[20-21] Systematic use of multi-method and meta-synthesis approaches are needed to secure comprehensive understandings of resilient adaptive capacities and processes.[6]
4. multi-level, multi-context, and cross-country resilience studies. There is a need for a broad, interlinked set of empirical studies to identify and describe resilience at multiple levels of the healthcare system, in different empirical settings, and in cross-country comparative studies.[6 30] To date, most resilience studies have been conducted in acute/emergency room settings.[21] The role of various contextual factors (e.g. regulatory systems, cultural and organizational factors, leadership) remains relatively unexplored and in need of investigation and theorizing.[25 31]
5. validated indicators and outcome measures to assess resilience in high quality healthcare settings. In conducting comprehensive analyses of how systems become resilient, validated measures for detecting, measuring, assessing and verifying adaptive capacities are urgently needed.[6 20]
6. evidence-based interventions and improvement efforts. Large-scale research studies are needed to identify, develop and evaluate RiH interventions that enable integration into improvement efforts and management routines in practice.[6]

This longitudinal research program will address these challenges by bringing quality and safety expertise together with healthcare professionals, patients and other stakeholders, providing a unique opportunity to conduct comprehensive multidisciplinary research that goes beyond current practices in five distinct ways: Firstly, by developing a RiH framework based on resilience as originally applied in psychology, ecology, and engineering;[1] secondly, by using a transdisciplinary, multi-level (micro/meso/macro) approach;[21 32] thirdly, by synthesizing longitudinal in-depth studies in differing empirical healthcare settings to identify context specific and/or context independent features of resilience; fourthly, by conducting cross-country comparative studies; and fifthly, by focusing on the role that patients and other stakeholders have in RiH research and practice.

Objective and research questions

The primary objective of the research program, it follows, is to reform the understanding of quality in healthcare by the development, implementation, and test of a theoretical and practical Resilience in Healthcare (RiH) framework. The RiH program covers the quality components of patient safety, continuity of care, patient-centeredness, and clinical effectiveness. More specifically, the RiH program addresses the following research questions:

1. How can an integrative theoretical framework for RiH be described to understand and improve quality at different system levels?
2. How can involvement of patients and stakeholders in RiH be described and improved?
3. How can RiH be described and improved in different healthcare settings?
4. How can the role of collaborative learning in RiH be described and improved?
5. How can RiH be identified, analysed and compared in different international healthcare settings?

Research setting

The RiH program is primarily centered around the Norwegian healthcare system. Through a cross-country comparative study, the international healthcare context is included covering five other countries (Australia, England, Japan, Netherlands, & Switzerland). These countries are strategically selected to represent a variety of developed healthcare systems and demographics. The international research setting is described in more detail in a forthcoming study protocol focusing on the cross-country comparison.[33]

As in most other developed countries, the focus on healthcare quality and safety in Norway has increased over the past 15 years. The first national patient safety campaign (2010-2013) initiated a systematic measurement of patient harm in Norwegian hospitals. The number of harmed hospitalized patients was stable at around 14 % from 2012 to 2017, with a significant reduction in 2018 to 11.9%. There has been a major focus on establishing stable structures and cultures for patient safety in the specialized healthcare services. The National Patient Safety program (2014-2018) continued the attention on quality and safety and was supported by a leadership-focused regulatory effort (2017) pointing to the role of managers in primary and specialized healthcare services in ensuring high quality services. Since 2013, Norway has published annual reports to the Parliament (Storting) on the status, challenges and measures for quality and safety in healthcare. In 2019, the Norwegian Directorate of Health launched a new five-year action plan for patient safety and quality improvement (2019-2023). It states that despite the implementation of national quality indicators, quality registries, patient pathways, patient harm measurements, electronic patient records, infection prevention, and improvement bundles, there are still challenges in need of a national and coordinated effort.[34]

The Norwegian population is 5.3 million and the healthcare system is semi-decentralized mainly based on public funding. The state is responsible for specialist care (administered by four Regional Health Authorities) and the municipalities are responsible for providing primary care services to its inhabitants

(e.g. nursing homes, home care, general practitioners, emergency rooms). The country is characterized by large geographical distances with variation across counties from the most central parts around the largest cities, to the most rural areas in the northern part of the country. Some counties are characterized by fjords, mountains, a harsh and dark winter climate, and long distances to the nearest hospitals, including ferries from islands or across fjords. Seventy five percent of the population live in the 100 most densely populated municipalities. The most highly populated municipality has 673.000 inhabitants, while the smallest has 200 inhabitants.[35]

The regulation of quality and safety in healthcare, like in many other sectors in Norway, is based on enforced self-regulation and internal control.[36] The Norwegian Board of Health Supervision is the national regulatory body for health and care services administered by the Ministry of Health and Care Services. At the regional level, 10 county governors oversee and inspect services within both primary and specialized health care. The 356 municipalities are granted wide discretion in organizing of primary care services.

METHODS AND ANALYSIS

Overall design

A collaborative interactive research design will be used to ensure the establishment of a comprehensive RiH framework with both theoretical and practical outcomes. This type of collaborative design is ideal when the aim is to bring key actors (multi-disciplinary researchers, practitioners, patients, and other stakeholders) together in a partnership centered on undertaking multiple phases of development, implementation, evaluation and improvement[37-39] as is the purpose of the RiH research program.

Iterative cycles of research activities will be organized in five closely integrated work packages (WPs) (see figure 1). An integrative theoretical framework will be established (WP1), alongside a conceptual model for patient and stakeholder involvement in RiH (WP2) and best collaborative learning methods to translate the RiH framework into practice (WP4). Synthesizing findings across in-depth longitudinal empirical research in a sample of healthcare settings in Norway (WP3) and in a cross-country comparative study (WP5) will establish resilient adaptive capacities facilitating a common inclusive RiH framework.

[Insert Figure 1. Overview of the RiH research program]

The five-year research program will have two main phases: an explorative phase with screening, synthesis, and validation of results from a sample of existing empirical projects in different healthcare settings, and an intervention phase with design, implementation, and evaluation of measures to support resilient adaptive capacities in healthcare quality. WPs 1, 2, and 4 constitute the main conceptual WPs in the research program (see figure 1). These WPs will collect data across different empirical projects in Norway (WP3) and internationally (WP5) and will contribute to WP3 and WP5 by developing theoretical approaches, PSI and collaborative learning tools in an iterative process. The three conceptual WPs are also interconnected and relate to each other in different ways. The following relationships will be studied in the RiH research program:

- Enactment of resilient adaptive capacity at different levels of the healthcare system requires PSI, and, therefore, there is a need to understand the role of PSI in resilience and how it can be developed and supported.

- Enactment of resilient adaptive capacity at different levels of the healthcare system requires collaborative learning and working, and, therefore, needs to understand the role of collaborative learning and how it can be developed and supported.
- PSI in the enactment of resilient adaptive capacity requires collaborative learning and working, and therefore there is a need to understand, develop, implement, and evaluate collaborative learning tools and resources for PSI activities.

Sample of empirical projects

The RiH research program will use data from a broad sample of empirical projects from a wide variety of healthcare settings. The sample will be drawn from a set of former, ongoing, or recently granted research projects in which members of the Centre for Resilience in Healthcare in Norway are involved. Approximately 50 research projects, postdoctoral projects and PhD-projects will be screened according to a set screening protocol and a Quality and Resilience Trigger Tool (see supplementary files) to establish how they relate to resilience and which healthcare quality components they cover. After screening, a total sample of approximately 20 empirical projects will be selected to secure a comprehensive range of healthcare settings (see figure 1), stakeholders (i.e. patients, carers, healthcare professionals, managers, regulators, local and national healthcare authorities), quality dimensions (patient safety, continuity of care, patient-centeredness, clinical effectiveness), and resilient adaptive capacities (individual, team/unit, organizational, larger system).

The sample of empirical projects will be subject to two types of analyses; a broad explorative meta-synthesis of all projects, and an in-depth deductive content analysis of a sub-sample of projects according to categories identified in the explorative synthesis.

For the international cross-country resilience study (WP5), empirical case studies will be conducted in six countries according to an agreed study protocol.[33] A set of case studies from a selection of hospitals in Australia, England, Japan, Netherlands, Switzerland, and Norway will form the international sample.

Work package descriptions

In the following, the five WPs are described with regards to main purpose, research question, and work tasks including the activities detailing relationships across work packages.

WP1 – RiH theoretical framework

The purpose of WP1 is to establish a robust, validated, integrative and comprehensive RiH theoretical framework to improve the understanding of quality in different healthcare settings and at different system levels. The theoretical framework development will include a review of the literature and synthesis of data across the empirical projects included in the RiH program. The validation of the framework will occur in selected healthcare settings and through targeted empirical processes including use of PSI and collaborative learning resources.

Research question:
How can an integrative theoretical framework for RiH be described to understand and improve quality at different healthcare system levels?

Work tasks:
1) *Develop an initial theoretical framework* for resilience by reviewing relevant theoretical concepts, including resilience at an individual psychological level (i.e. micro);[40] at an organizational level (i.e.

meso); [2 4-6 41] and at a national and international level (i.e. macro).[30 42] A group of acknowledged expert researchers will attend a workshop to advance and evaluate concepts and principles of resilience and their interrelations, leading to the development of an initial theoretical framework presented and published in an edited volume.

2) *Develop empirical and analytical indicators* at the micro, meso and macro levels by positioning the RiH program understanding of resilience in relation to the existing concepts identified in Work Task 1, and by developing empirical indicators for resilience to be used in selected and diverse data collection tools.

3) *Collect and synthesize empirical evidence* from the selected projects (WP3) in different settings as input to context specific and system level specific elements of the theoretical framework. Empirical evidence will be collected and analysed using a qualitative meta-synthesis approach[43] on the basis of the sample of empirical projects, meaning that data collection will be conducted across current project documentation (protocols, summaries, publications, etc), researchers involved (interviews, focus groups), and project activities (observations).

4) *Validate the integrative RiH framework* based on analytical syntheses of empirical evidence collected as part of work task 3 and test the framework in a selected sample of projects (WP3, WP5) across system levels using member checks, group techniques, and workshops. Patient and stakeholder analyses conducted in WP2 and collaborative learning tools developed in WP4 will form the basis for these processes. The validated integrative RiH framework will include the possibility for creating specific models or resilience representations adjusted to different empirical settings or system levels.

WP2 – Patient and stakeholder involvement in RiH

The purpose of WP2 is to describe how patients and stakeholders are actively involved in creating and sustaining RiH and how these practices can be supported and improved to facilitate high-quality healthcare. WP2 will employ a collaborative interactive research design involving patients, carers, healthcare professionals, regulatory bodies, the public and other major stakeholders (e.g. patient organizations, policy makers) as equal partners at all stages of the research process.[39]

Research question:
How can involvement of patients and stakeholders in RiH be described and improved?

Work tasks:

1) *Establish the current knowledge base on PSI in RiH*
   A narrative review of the literature will be conducted to establish the current knowledge on patient and stakeholder contributions to resilience in healthcare. The literature will be analysed according to how and in which healthcare settings different groups of patients and stakeholders contribute to resilience across different system levels.
2) *Conduct patient and stakeholder analyses in the core sample of empirical projects*
   Within a sub-sample of empirical projects included in WP3, we will conduct systematic patient and stakeholder analyses[44] to generate knowledge about how relevant actors understand and articulate their interests, interrelations, agendas, and the influence or resources they bring to bear on RiH. The stakeholder analyses will form the basis for developing key principles for how the conceptual model for PSI in RiH can be co-produced and designed.
3) *Explore and develop a conceptual model for how PSI in RiH can be understood and improved*
   A conceptual model for PSI in RiH will be developed by synthesizing results on how patients and stakeholders are involved and contribute to RiH in the sample of empirical projects included in WP3, and how the drivers for their involvement can be understood. Following the patient and stakeholder analyses conducted as part of work task 2, key actors will participate in a co-production process to develop the model by taking roles as panel members, user representatives, advisors or "co-researchers" (employed in part time posts). WP2 will collect data across the sample of empirical

projects using multiple methods (WP3). Topics to be covered are situations where patients and stakeholders contribute to resilience, types of involvement, drivers and barriers to involvement, contextual issues, etc.

4) *Evaluate and refine the PSI in RiH model by using collaborative learning tools and innovations.* The conceptual model for PSI in RiH will be tested and validated through the development of a set of learning tools and innovations (e.g. "meeting arenas", simulation scenarios) in close collaboration with WP4. The co-production process described in work task 3 will continue to cover these issues.

WP3 – RiH in Norwegian healthcare settings

The purpose of WP3 is to document resilient adaptive capacities across the broad sample of empirical projects included in the research program, to conduct detailed analyses of selected projects, and based on this develop and implement measures for resilient adaptive capacities in selected healthcare settings by means of patient and stakeholder involvement and collaborative learning.

Research question: How can RiH be described and improved in different healthcare settings?

Work tasks:

1) *Analyse the broad sample of empirical projects using a quality-resilience framework.* For the total sample of empirical projects (approximately 20 projects) a framework for analysis will be developed for establishing the relationship between resilient adaptive capacities and healthcare quality dimensions, based on the Quality and Resilience Trigger Tool (see supplementary file), system levels, and empirical setting. The analytical framework will be applied on data collected using project documentation (e.g. publications, study protocols, reports, etc.), semi-structured interviews or focus group interviews with project researchers, or observation of project meetings, workshops, etc.
2) *Synthesize in-depth analyses of a sub-sample of empirical projects*. For a sub-sample of empirical projects deductive content analyses[45] will be synthesized across system levels and healthcare settings. The content analyses will be based on categories resulting from the meta-analysis in work task 1. Analytical workshops will be held with the respective project researchers and with PSI co-researchers to produce the synthesis. Results will be presented as a set of indicators for resilient adaptive capacities at the micro, meso, and macro levels in close collaboration with WP1.
3) *Develop, implement, and evaluate RiH interventions.* Based on the synthesis produced in work task 2, a RiH intervention bundle (three to five measures) will be co-produced with the patient and stakeholder groups identified in WP2 using the collaborative learning tools established in WP4. The intervention bundle contents will be based on empirical evidence gathered in the analyses of work task 1 and work task 2 and will be implemented in three selected healthcare settings (micro, meso, macro). Possible impact of the RiH intervention bundle will be measured using a process evaluation approach.[46]

WP4 – Collaborative learning in RiH

The purpose of WP4 is to describe the relationship between collaborative learning and resilience to establish a framework that supports adaptive capacities across diverse healthcare settings and system levels. The collaborative learning framework will build on interactive, participatory, and reflexive approaches.

Research question: How can the role of collaborative learning in RiH be described and improved?

Work tasks:

1) *Establish the current knowledge base on collaborative learning in RiH.* A review of the literature will be conducted to provide an overview of the role of collaborative learning in current RiH

studies. This literature will be analysed according to how learning is described in relation to resilience, where learning occurs, who is involved in learning situations, and how resilient adaptive capacities are learnt, and that learning is enhanced through collaborative arrangements.

2) *Analyse data from the sample of empirical projects in WP3 to identify collaborative learning needs and pedagogically rich activities.* Collaborative learning needs and pedagogically-rich activities in healthcare settings will be synthesized across the empirical projects included in WP3. WP4 will collect data across the empirical projects using multiple methods (WP3). Processes appraised in these projects will include collaborative meetings, teamwork, learning arenas, learning resources, learning from positive situations, interfaces, participants, etc.
3) *Apply participatory design principles to develop and pilot-test a set of collaborative learning tools and components (CL framework) to support resilient adaptive capacities.* In collaboration with WP2 and based on the learning needs and pedagogically-rich activities identified in WP3 analyses, participatory design processes will be run with the aim of developing the contents of, and the underlying principles of a CL framework. The contents of the framework will likely include learning tools such as structured meeting arenas, simulation scenarios, interactive digital guides, webinars, e-dialogue forums, etc. The underlying principles of the framework will address issues such as learning goals, participants, procedures, resources, etc.
4) *Implement and evaluate the CL framework in selected empirical settings.* The pilot-tested CL framework will be revised and subsequent trials implemented in three different empirical settings in collaboration with WP3; one focusing on healthcare professionals' individual and team-based resilient adaptive capacities (i.e. micro-level), one focusing on organizational resilient adaptive capacities (i.e. meso level), and one focusing on intra-organizational resilient adaptive capacities (i.e. macro level). A RiH laboratory will be created to support the implementation. Possible impact of the CL framework will be studied using a participant observation approach[47] as part of the process evaluation approach in WP3.

WP 5 – Cross-country comparative resilience studies

The purpose of WP5 is to conduct, analyse, and compare empirical studies in different countries to establish the cross-country characteristics of RiH and to explore under which conditions RiH is enacted in different countries. The cross-country RiH studies will be conducted in six countries; Netherlands, Australia, England, Switzerland, Japan, and Norway according to a joint study protocol.[33]

Research question: How can RiH be identified, analysed and compared in different international settings?

Work tasks:

1) *Conduct an initial analysis of the healthcare systems* in the six countries. The analysis will be based on mapping and comparison of healthcare contextual issues such as funding and access, patient rights, regulatory framework, accreditation and monitoring, information availability, and resources available.
2) *Conduct exploratory empirical case studies of RiH* within selected healthcare settings in the six countries. This will involve interviews at different levels (i.e. micro, meso, macro) and observations of clinical work, team and managerial processes in pre-defined empirical fields. The aim will be to identify resilient adaptive capacities across countries, system levels and empirical contexts.
3) *Conduct within-case analysis of RiH* in each country according to a joint protocol to determine resilient adaptive capacities at micro, meso and macro levels in the selected empirical settings in each country. The 'within-case' analysis will result in six country-specific reports in English to enable cross-country comparison.
4) *Conduct cross-case analysis of RiH* to synthesize and compare findings across the six country reports using a common conceptual framework. Comparing results across multiple empirical settings, levels and countries will allow identification of differing resilient adaptive capacities and how they are shaped by organizational, cultural, economic, and regulatory factors.

5) *To develop guidance* for policy makers, managers and practitioners for operationalizing and implementing RiH in different countries and organizational contexts. This will include developing freely accessible anonymized RiH case study summaries to inform further development of RIH studies and interventions, and to influence quality and safety programs internationally.

Patient and public involvement

The RIH project integrates patient and stakeholder involvement throughout all research phases from project design, planning, data collection, analysis and publication. A specific work package (WP2) is set aside to assure involvement at all levels of the Norwegian healthcare system. A patient and citizen representative has been involved in the project development and is co-leading the international Expert Advisory Board established in the project. Co-researchers will be employed in different roles throughout the program.

ETHICS AND DISSEMINATION

Ethics

The RIH program is approved by Norwegian Centre for Research Data (No. 864334). Each individual study in the longitudinal research program constituting the empirical WP3 will apply for ethical approval from the Norwegian Centre for Research Data or the Regional Committees for Medical and Health Research Ethic. As different countries have different requirements for ethical approval of research studies, each study in the cross-country WP5 will apply for ethical approval in the respective country if required.

Dissemination

The RIH research program has a publication and dissemination strategy focusing on the sharing of scientific knowledge, information and results, and on public engagement from relevant patient and stakeholder representatives. The results from the research program will be disseminated through scientific articles, PhD dissertations, and presentations at national and international conferences, as well as in social media, newsletters, and in the press.

The research program will organize annual RiH research seminars for academic partners, empirical partners, and stakeholders. RiH consortium members, Expert Advisory Board members, and leading international researchers will be invited to present state-of-the-art research on Resilience in Healthcare. Annual RiH patient/stakeholder seminars will contribute to create a collaborative learning arena involving relevant stakeholders in the Norwegian healthcare system and RiH researchers, to enable translation of research evidence into interventions for stakeholder use. The RiH project will use new forms of virtual platforms to ensure continuous direct communication on a regular basis among the consortium partners. RiH will also take advantage of virtual share-points to enable the secure sharing of documents between partners.

Data statement The datasets generated during and/or analysed during the current research program are available from the corresponding author on reasonable request.

Acknowledgements We thank Roland Bal, Jeffrey Braithwaite, Mathilde Bourrier, Carolyn Canfield Mary Chambers, and Marianne Storm for their intellectual inputs to the grant application resulting in

the RiH Research Program. We also thank Cecilie Haraldseid-Driftland for comments on an earlier draft of the protocol, and Janne Gro Alsvik for help in preparing the manuscript for submission.

Author contributions KA is the principal investigator of the research program and designed the overall research proposal, drafted the original manuscript and contributed to revisions and additions to the manuscript. SW and VG contributed with substantial intellectual contents in the design of the research program, drafted substantial parts of the original manuscript, and contributed to revision to the manuscript. SS, ON, OR, SB, TM, and JA contributed to the design of the research program, drafted parts of the original manuscript and contributed to revisions to the manuscript. All authors approved the final version of the manuscript.

Funding The RiH research program has received funding from the Research Council of Norway under the FRIPRO Toppforsk program, grant agreement no 275367. The University of Stavanger, Norway, the Norwegian University of Science and Technology in Gjøvik, and the Norwegian Air Ambulance Foundation support the program with in-kind funding.

Competing interests None declared.

Patient consent for publication Not required.

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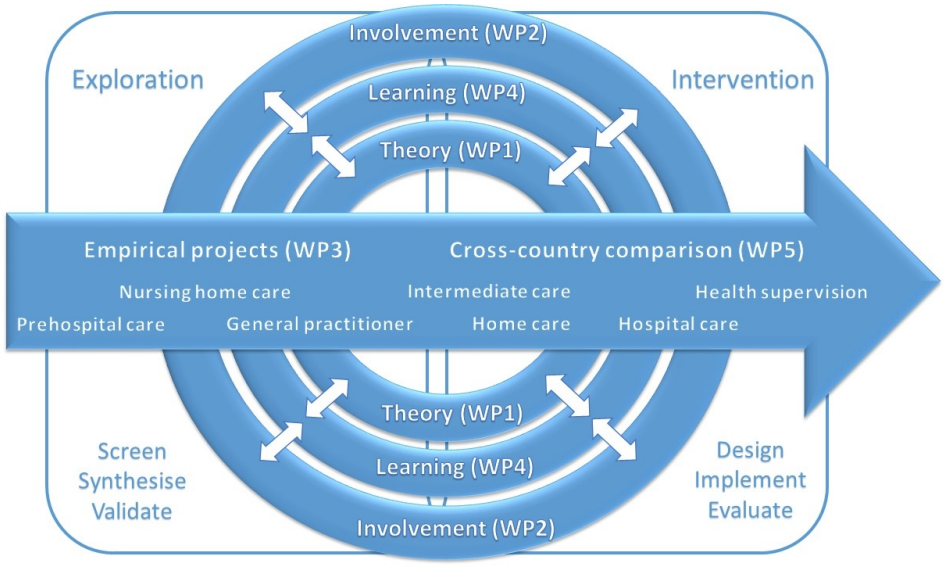

Figure 1. RiH research program

338x190mm (96 x 96 DPI)

Screening Protocol - Resilience in Healthcare (RiH)

Aim

Systematically go through all SHARE affiliated former (going back to 2010) and ongoing research projects to consider inclusion in the RiH research project according to "What is the essence of this research project? Is the focus here on quality and resilience? In what way is this project and its findings potentially relevant for the RiH project?"

1. **Determine which research projects have a SHARE affiliation**

   a) Search through the SHARE website, the SNLA website (projects from 2017 and onwards), the NTNU Gjøvik website (projects from 2015 and onwards), etc. for information on SHARE-affiliated research projects.

   b) Use SHARE documentation and conversations with key personnel, coordinators and/or contact persons with the three SHARE partners for quality assurance of affiliated projects.

2. **List all SHARE affiliated projects for initial screening**

   a) Search in Brage, Cristin and Google Scholar for relevant project information and outputs (PhD-theses, journal articles, protocols, etc.)

   b) Include all current, finished, and newly started SHARE projects in a screening table according to project title, affiliated researcher(s), project status (finalised, ongoing, start-up), empirical setting, clinical field, and/or stakeholders involved.

   c) Use conversations with key personnel, coordinators and/or contact persons with the three SHARE partners for quality assurance of the screening table.

3. **Initial screening of all SHARE research projects**

   Based on the list of project titles and belonging project information compiled during step 2, screen all projects for relevance to quality and resilience according to the *"RiH Quality & Resilience Trigger Tool"*.

   Mark projects in green if they are definitive (or highly likely) inclusions; mark projects in orange if further consultation of project documentation is needed; mark projects in red if they are not relevant for inclusion.

4. Second level screening of projects marked in orange

Second level screening of projects marked in orange based on the same information as in step 3, conducted by a second researcher. If necessary use additional information through other publicly available sources or seek access to approved project plans and/or protocols from involved researchers.

Mark projects in green if they are definitive (or highly likely) inclusions; mark projects in red if they are not relevant for inclusion. Mark projects in orange if still unsure of inclusion status and further consultation with collegaues is needed.

5. Group consensus process for final inclusion assessment

Any projects still marked in orange will require further assessment of inclusion in consultation with colleagues.

A group consisting of 5 members will be formed to establish consensus for final inclusion. The group will in their process also include impartiality discussions regarding the issue of conducting research on researchers according to the *"RiH impartiality principles"*.

Make final decision regarding inclusion/exclusion of projects marked orange, and document possible actions concerning impartiality.

6. Summary of final project inclusion

Summarize included projects according to quality and resilience relevance, project phase, empirical setting, clinical domain, and stakeholder groups.

RiH Quality & Resilience Trigger Tool

Aim

To screen SHARE-affiliated research projects' relevance according to the RiH project's focus on quality and resilience.

Triggers

First define how quality is addressed in the project (step 1), then how resilience plays a role in quality (step 2). NB! Resilience is related to actions, activities, processes ("Resilience as a verb")

1. Quality

Projects need to be marked for one or more of the four quality dimensions in order to move to step 2 on resilience.

Patient experiences, patient centeredness, patient involvement

Patient safety, risk, adverse events

Clinical effectiveness, treatment and care interventions, effects, patient outcomes

Care coordination, patient pathways, care transitions, integrated care, collaboration across service providers and care levels

2. Resilience

Adaptation, variation, trade-offs, improvisation, response, complexity

- Individual capacity (knowledge, competence, learning, personal characteristics, cognitive, behavioral strategies)
- Team/unit capacity (communication, collaboration, learning)
- Organisational capacity (resources, organization, culture)
- Larger system capacity (infrastructure, regulation, framework conditions)

Changes, challenges, disruption, development, improvement, success, enhancement, growth, recovery, transformation

Collaborative learning, work practice, teamwork, problem solving, interaction

Stakeholder actions, knowledge-brokering, co-creation, contribution, information, engagement

BMJ Open

Resilience in Healthcare (RiH) - A Longitudinal Research Program Protocol

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-038779.R1
Article Type:	Protocol
Date Submitted by the Author:	13-Aug-2020
Complete List of Authors:	Aase, Karina; University of Stavanger, SHARE - Centre for Resilience in Healthcare Guise, Veslemøy; University of Stavanger, SHARE - Centre for Resilience in Healthcare Billett, Stephen; Griffith University, School of Education and Professional Studies Sollid, Stephen; Norwegian Air Ambulance Foundation; University of Stavanger Njå, Ove; University of Stavanger, Faculty of Science and Technology Røise, Olav; Oslo University Hospital, Division of Orthopedic Surgery; University of Stavanger, SHARE - Centre for Resilience in Healthcare Manser, Tanja; University of Applied Sciences and Arts Northwestern Switzerland, School of Applied Psychology Anderson, Janet; King's College London, Florence Nightingale Faculty of Nursing, Midwifery & Palliative Care; University of Stavanger, SHARE - Centre for Resilience in Healthcare Wiig, Siri; University of Stavanger, SHARE - Centre for Resilience in Healthcare
Primary Subject Heading:	Health services research
Secondary Subject Heading:	Health policy
Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health & safety < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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Resilience in Healthcare (RiH) – A Longitudinal Research Program Protocol

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Keywords:

Resilience, Quality of Healthcare, Patient Safety, Longitudinal Studies, Interdisciplinary Research

ARTICLE SUMMARY

Introduction

Over the past three decades, extensive research has been undertaken to understand the elements of what constitutes high quality in healthcare. Yet, much of this research has been conducted on

individual elements and their specific challenges. Hence, goals other than understanding the complex of factors and elements that comprises quality in healthcare have been privileged. This lack of progress has led to the conclusion that existing approaches to research are not able to address the inherent complexity of healthcare systems as characterized by a significant degree of performance variability within and across system levels, and what makes them resilient. A shift is, therefore, necessary in such approaches. Resilience in Healthcare (RiH) adopts an approach comprising a comprehensive research program that models the capacity of healthcare systems and stakeholders to adapt to changes, variations and/or disruptions: i.e. resilience. As such, RiH offers a fresh approach capable of capturing and illuminating the complexity of healthcare and how high quality care can be understood and advanced.

Methods and analysis

Methodologically, to illuminate what constitutes quality in healthcare, it is necessary to go beyond single-site, case-based studies. Instead, there is a need to engage in multi-site, cross-national studies, and engage in long-term multidisciplinary collaboration between national and international researchers interacting with multiple healthcare stakeholders. By adopting such processes, multiple partners and a multi-disciplinary orientation, the five-year RiH research program aims to confront these challenges and accelerate current understandings about and approaches to researching healthcare quality.

The RIH research program adopts a longitudinal collaborative interactive design to capture and illuminate resilience as part of healthcare quality in different healthcare settings in Norway and in five other countries. It combines a meta-analysis of detailed empirical research in Norway with cross-country comparison from Australia, Japan, Netherlands, Switzerland, and the UK. Through establishing a RiH framework, the program will identify processes with outcomes that aim to capture how high-quality healthcare provisions are achieved. A collaborative learning framework centered on engagement aims to systematically translate research findings into practice through co-construction processes with partners and stakeholders.

Ethics and dissemination

The RiH research program is approved by the Norwegian Centre for Research Data (No. 864334). The empirical projects selected for inclusion in this longitudinal research program have been approved by the Norwegian Centre for Research Data or the Regional Committees for Medical and Health Research Ethics. The RIH research program has an embedded publication and dissemination strategy focusing on the progressive sharing of scientific knowledge, information and results, and on engaging with the public, including relevant patient and stakeholder representatives. The findings will be disseminated through scientific articles, PhD dissertations, presentations at national and international conferences, and through social media, newsletters, and the popular media.

Strengths and limitations of this study

- Moving beyond the individual case study approach and taking a longitudinal, multilevel, cross-case approach to explore the complexities of resilient capacities required for high quality healthcare.
- The 5-year longitudinal research program offering an integration of resilience theory, collaborative learning as well as patient and stakeholder involvement is enacted through a multi-disciplinary approach.
- Combining detailed empirical research in diverse healthcare settings in one country, with cross-country comparison of resilient capacities in six other countries as a basis for meta-analysis.
- A potential limitation is that the project duration of five years may not be sufficient to demonstrate how resilient capacities can improve healthcare quality by means of patient and stakeholder involvement and collaborative learning.

INTRODUCTON

Resilience in healthcare

Resilience in healthcare is central to what constitutes quality in healthcare provision. Defined by the proactive capacity that organizations, units, teams, and individuals enact to adapt to changes and potential challenges in everyday practices, rather than to resist them, resilience results in high quality care. This way of defining resilience is held to be comprehensible regardless of the healthcare system component or level under investigation. Resilience should, furthermore, be explored as a multi-level phenomenon with collaborative learning and stakeholder involvement as vital prerequisite pillars.[1] Stakeholders in healthcare are any person, group or organization who provides, receives, manages, regulates or pays for healthcare. As such, they involve patients, carers, healthcare professionals, managers, regulatory bodies, non-governmental organizations (NGOs), municipalities, regional authorities, etc.

Resilient healthcare is assumed to be underpinned by adaptive capacity in the healthcare system. It involves the use of internal (e.g. sense making, experience) and external resources (e.g. colleagues, networks, regulation) to adapt everyday functioning (e.g. adaptation of care processes as a result of variability in demand or time constraints), to successfully resolve challenging issues to continue to operate with a high level of quality.[2] In contrast to much existing research on healthcare quality, which tends to focus on healthcare failures,[3 4] resilience research is focused on capturing healthcare processes with successful outcomes to illuminate how high quality is generated across healthcare systems, organisations and, crucially, in everyday clinical work.[5] Evidence reported in sectors other than healthcare indicates that resilience comprises capacities such as flexibility, adjustments, improvisation, adaptation, and responding to variability.[6] These capacities are currently explored and partially acknowledged in the healthcare sector, but have to date been limited to small-scale individual case studies, with a few notable exceptions.[7 8] Detailed, multi-site, multi-disciplinary and multi-level research is, therefore, needed to study resilience in healthcare over time and empirically in different clinical and system contexts.

Resilience in healthcare as conceptualized above is rooted in resilience theory. Resilience is primarily a guiding concept represented in different ways in theories from diverse scientific disciplines.[1] Engineering and human resources perspectives seek to understand and strengthen how people adapt and build adaptive capacity into technological systems or organisations. Psychological perspectives focus on individual psychological capacities to cope with adversity and is often linked to vulnerable groups. Ecological perspectives focus on how biological systems facing unpredictable changes adapt to cope with these and maintain system stability. Societal perspectives seek to understand and plan responses to and recovery from large scale disasters to preserve system stability and infrastructure. These diverse theories and models about adapting to problems, changes and adversity have informed health services research, including resilient healthcare. As such, resilience in healthcare is a growing research field that seeks to understand and improve system functioning from institutional, work systems and personal perspectives to deliver high quality care and safe patient care.[1]

Background and status of knowledge

Healthcare quality is a highly prioritised global health issue that involves the components of patient safety, continuity of care, patient-centeredness, effectiveness, equity, and efficiency.[9] Over the past three decades, extensive research has been undertaken to understand these quality components

individually. However, many and perhaps most efforts are conducted in silos (i.e. mono-disciplinary, without crossing healthcare levels or organisational boundaries) and significant advancements have yet to be made. For example, surveys of patient experiences indicate that hospitals continue to score poorly regarding coordination, continuity of care, and patient-centeredness.[10 11] Furthermore, data consistently show that, internationally, the rate of harm due to healthcare-induced adverse events remains between 5-10% for hospitalized patients with some variation across countries.[12-16] Higher numbers are indicated for primary care patients[17] including, for example, medication administration-related adverse events at a range of 13-31 %.[18]

The relative consistency of these findings over time and in different geographical locations leads to the conclusion that many existing approaches to research that rely on a range of standardised methods (e.g. root cause analysis, checklists, handover protocols) are inadequate for understanding, facilitating and maintaining healthcare quality. Instead, poor healthcare quality is often related to the inherent complexity of healthcare systems, characterized by silos, multiple stakeholder interactions and a significant degree of performance variability within and across system levels.[3 4 19 20] A radical change is, therefore, necessary to understand the complexity of care processes, identify how resilience can be supported, and build an interdisciplinary theoretical and methodological approach that bridges the social sciences, the clinical field, and quality and safety research.[21]

Empirical research from across multiple healthcare settings is necessary to capture, illuminate, and, subsequently, support resilient capacities and processes across entire healthcare systems[20] (e.g. by informing the development of interventions to improve capacity for adaptive change).[22] However, apart from a small number of studies within specific clinical areas,[23] healthcare research conducted from a resilience perspective is still in its infancy.[24] The current studies predominantly utilize qualitative designs[23 25 26] while a few quantitative and multi-site studies exist.[7 8 27] Therefore, limited understandings are currently available to elucidate how resilience is manifest in different healthcare settings and how factors such as type and pace of clinical work or patient acuity affects the levels of resilience afforded by the healthcare system. Consequently, research is needed to systematically identify and subsequently test and evaluate concepts and interventions that promote resilience as a means to secure high quality healthcare in a variety of healthcare settings and contexts.[20]

Research challenges

The RiH research program aims to address six major research challenges related to resilience and its role in high quality healthcare. These are related to the current gaps in the literature concerning:

1. a comprehensive explanatory theory of resilience. Existing efforts to develop sound concepts and models of resilience lack extensive empirical testing.[28-30] Existing research also lacks theoretical integration of the multiple levels of the healthcare system, from individuals and teams (micro), to organisations (meso), to regulatory bodies and policy level actors (macro).
2. patient and stakeholder involvement in studies of RiH,[31] despite persistent claims within the literature that patients, carers and other healthcare stakeholders are fundamental co-creators of resilience.[3 20 32-34] Addressing this shortcoming contains the need to develop appropriate procedures for patient and stakeholder involvement throughout the research process[35] which includes investigating how patients can contribute to resilience.
3. comprehensive methodological approaches to improve the validity, reliability, and efficiency of RiH research, innovative methods are required to identify and document adaptive capacities in a longitudinal perspective.[22 23] Systematic use of multi-method and meta-synthesis approaches are needed to secure comprehensive understandings of resilient capacities and processes.[6]
4. multi-level, multi-context, and cross-country resilience studies. There is a need for a broad, interlinked set of empirical studies to identify and describe resilience at multiple levels of the healthcare system, in different empirical settings, and in cross-country comparative studies.[6 35] To

date, most resilience studies have been conducted in acute/emergency room settings.[23] The role of various contextual factors (e.g. regulatory systems, cultural and organizational factors, leadership) remains relatively unexplored and in need of investigation and theorizing.[30 36]

5. validated indicators and outcome measures to assess resilience in high quality healthcare settings. In conducting comprehensive analyses of how systems become resilient, validated measures for detecting, measuring, assessing and verifying adaptive capacities are urgently needed.[6 22]
6. evidence-based interventions and improvement efforts. Large-scale research studies are needed to identify, develop and evaluate RiH interventions that enable integration into improvement efforts and management routines in practice.[6]

This longitudinal research program will address these challenges by bringing quality and safety expertise together with healthcare professionals, patients and other stakeholders, providing a unique opportunity to conduct comprehensive multidisciplinary research that goes beyond current practices in five distinct ways: Firstly, by developing a RiH framework based on resilience as originally applied in psychology, ecology, and engineering;[1] secondly, by using a transdisciplinary, multi-level (micro/meso/macro) approach;[23 37] thirdly, by synthesizing longitudinal in-depth studies in differing empirical healthcare settings to identify context specific and/or context independent features of resilience; fourthly, by conducting cross-country comparative studies; and fifthly, by focusing on the role that patients and other stakeholders have in RiH research and practice.

Objective and research questions

The primary objective of the research program, it follows, is to reform the understanding of quality in healthcare by the development, implementation, and test of a theoretical and practical Resilience in Healthcare (RiH) framework. The RiH program covers the quality components of patient safety, continuity of care, patient-centeredness, and clinical effectiveness. More specifically, the RiH program addresses the following research questions:

1. How can an integrative theoretical framework for RiH be described to understand and improve quality at different system levels?
2. How can involvement of patients and stakeholders in RiH be described and improved?
3. How can RiH be described and improved in different healthcare settings?
4. How can the role of collaborative learning in RiH be described and improved?
5. How can RiH be identified, analysed and compared in different international healthcare settings?

Research setting

The RiH program is primarily centered around the Norwegian healthcare system. Through a cross-country comparative study, the international healthcare context is included covering five other countries (Australia, England, Japan, Netherlands, & Switzerland). These countries are strategically selected to represent a variety of developed healthcare systems and demographics. The international research setting is described in more detail in a forthcoming study protocol focusing on the cross-country comparison.[38]

As in most other developed countries, the focus on healthcare quality and safety in Norway has increased over the past 15 years. The first national patient safety campaign (2010-2013) initiated a systematic measurement of patient harm in Norwegian hospitals. The number of harmed hospitalized patients was stable at around 14 % from 2012 to 2017, with a significant reduction in 2018 to 11.9%. There has been a major focus on establishing stable structures and cultures for patient safety in the specialized healthcare services. The National Patient Safety program (2014-2018) continued the

attention on quality and safety and was supported by a leadership-focused regulatory effort (2017) pointing to the role of managers in primary and specialized healthcare services in ensuring high quality services. Since 2013, Norway has published annual reports to the Parliament (Storting) on the status, challenges and measures for quality and safety in healthcare. In 2019, the Norwegian Directorate of Health launched a new five-year action plan for patient safety and quality improvement (2019-2023). It states that despite the implementation of national quality indicators, quality registries, patient pathways, patient harm measurements, electronic patient records, infection prevention, and improvement bundles, there are still challenges in need of a national and coordinated effort.[39]

The Norwegian population is 5.3 million and the healthcare system is semi-decentralized mainly based on public funding. The state is responsible for specialist care (administered by four Regional Health Authorities) and the municipalities are responsible for providing primary care services to its inhabitants (e.g. nursing homes, home care, general practitioners, emergency rooms). The country is characterized by large geographical distances with variation across counties from the most central parts around the largest cities, to the most rural areas in the northern part of the country. Some counties are characterized by fjords, mountains, a harsh and dark winter climate, and long distances to the nearest hospitals, including ferries from islands or across fjords. Seventy five percent of the population live in the 100 most densely populated municipalities. The most highly populated municipality has 673.000 inhabitants, while the smallest has 200 inhabitants.[40]

The regulation of quality and safety in healthcare, like in many other sectors in Norway, is based on enforced self-regulation and internal control.[41] The Norwegian Board of Health Supervision is the national regulatory body for health and care services administered by the Ministry of Health and Care Services. At the regional level, 10 county governors oversee and inspect services within both primary and specialized health care. The 356 municipalities are granted wide discretion in organizing of primary care services.

METHODS AND ANALYSIS

Overall design

A collaborative interactive research design will be used to ensure the establishment of a comprehensive RiH framework with both theoretical and practical outcomes. This type of collaborative design is ideal when the aim is to bring key actors (multi-disciplinary researchers, practitioners, patients, and other stakeholders) together in a partnership centered on undertaking multiple phases of development, implementation, evaluation and improvement[42-44] as is the purpose of the RiH research program.

Iterative cycles of research activities will be organized in five closely integrated work packages (WPs) (see figure 1). An integrative theoretical framework will be established (WP1), alongside a conceptual model for patient and stakeholder involvement in RiH (WP2) and best collaborative learning methods to translate the RiH framework into practice (WP4). Synthesizing findings across in-depth longitudinal empirical research in a sample of healthcare settings in Norway (WP3) and in a cross-country comparative study (WP5) will establish resilient capacities facilitating a common inclusive RiH framework.

[Insert Figure 1.]

Figure legend: Figure 1. Overview of the RiH research program

The five-year research program (01.09.2018 – 31.10.2023) will have two main phases: an explorative phase with screening, synthesis, and validation of results from a sample of existing empirical projects in different healthcare settings, and an intervention phase with design, implementation, and evaluation of measures to support resilient capacities in healthcare quality. WPs 1, 2, and 4 constitute the main conceptual WPs in the research program (see figure 1). These WPs will collect data across different empirical projects in Norway (WP3) and internationally (WP5) and will contribute to WP3 and WP5 by developing theoretical approaches, patient and stakeholder involvement, and collaborative learning tools in an iterative process. WPs 1-4 will progress across the entire project period (2018-2023) while WP5 will commence and progress across the second half of the project period (2020-2023). The three conceptual WPs are also interconnected and relate to each other in different ways. The following relationships will be studied in the RiH research program:

- Enactment of adaptive capacity at different levels of the healthcare system requires patient and stakeholder involvement, and, therefore, there is a need to understand its role in resilience and how it can be developed and supported.
- Enactment of adaptive capacity at different levels of the healthcare system requires collaborative learning and working, and, therefore, needs to understand the role of collaborative learning and how it can be developed and supported.
- Patient and stakeholder involvement in the enactment of adaptive capacity requires collaborative learning and working, and therefore there is a need to understand, develop, implement, and evaluate collaborative learning tools and resources for such activities.

Sample of empirical projects

The RiH research program will use data from a broad sample of empirical projects from a wide variety of healthcare settings. The sample will be drawn from a set of former, ongoing, or recently granted research projects in which members of the Centre for Resilience in Healthcare in Norway are involved. Approximately 50 research projects, postdoctoral projects and PhD-projects will be screened according to a set screening protocol (see Supplementary File 1) and a Quality and Resilience Trigger Tool (see Supplementary File 2) to establish how they relate to resilience and which healthcare quality components they cover. After screening, a total sample of approximately 20 empirical projects will be selected to secure a comprehensive range of healthcare settings (see figure 1), stakeholders (i.e. patients, carers, healthcare professionals, managers, regulators, local and national healthcare authorities), quality dimensions (patient safety, continuity of care, patient-centeredness, clinical effectiveness), and adaptive capacities (individual, team/unit, organizational, larger system).

The sample of empirical projects will be subject to two types of analyses; a broad explorative meta-synthesis of all projects, and an in-depth deductive content analysis of a sub-sample of projects according to categories identified in the explorative synthesis.

For the international cross-country resilience study (WP5), empirical case studies will be conducted in six countries according to an agreed study protocol.[38] A set of case studies from a selection of hospitals in Australia, England, Japan, Netherlands, Switzerland, and Norway will form the international sample.

Work package descriptions

In the following, the five WPs are described with regards to main purpose, research question, and work tasks including the activities detailing relationships across work packages.

WP1 – RiH theoretical framework

The purpose of WP1 is to establish a robust, validated, integrative and comprehensive RiH theoretical framework to improve the understanding of quality in different healthcare settings and at different system levels. The theoretical framework development will include a review of the literature and synthesis of data across the empirical projects included in the RiH program. The validation of the framework will occur in selected healthcare settings and through targeted empirical processes including use of patient and stakeholder involvement and collaborative learning resources.

Research question:
How can an integrative theoretical framework for RiH be described to understand and improve quality at different healthcare system levels?

Work tasks:
1) *Develop an initial theoretical framework* for resilience by reviewing relevant theoretical concepts, including resilience at an individual psychological level (i.e. micro);[45] at an organizational level (i.e. meso); [2 4-6 46] and at a national and international level (i.e. macro).[35 47] A group of acknowledged expert researchers will attend a workshop to advance and evaluate concepts and principles of resilience and their interrelations, leading to the development of an initial theoretical framework presented and published in an edited volume.

2) *Develop empirical and analytical indicators* at the micro, meso and macro levels by positioning the RiH program understanding of resilience in relation to the existing concepts identified in Work Task 1, and by developing empirical indicators for resilience to be used in selected and diverse data collection tools.

3) *Collect and synthesize empirical evidence* from the selected projects (WP3) in different settings as input to context specific and system level specific elements of the theoretical framework. Empirical evidence will be collected and analysed using a qualitative meta-synthesis approach[48] on the basis of the sample of empirical projects, meaning that data collection will be conducted across current project documentation (protocols, summaries, publications, etc), researchers involved (interviews, focus groups), and project activities (observations).

4) *Validate the integrative RiH framework* based on analytical syntheses of empirical evidence collected as part of work task 3 and test the framework in a selected sample of projects (WP3, WP5) across system levels using member checks, group techniques, and workshops. Patient and stakeholder analyses conducted in WP2 and collaborative learning tools developed in WP4 will form the basis for these processes. The validated integrative RiH framework will include the possibility for creating specific models or resilience representations adjusted to different empirical settings or system levels.

Intended outcomes:
1) Integrative RiH theoretical framework;
2) Multi-level empirical and analytical resilience indicators; and
3) Specific models or representations of resilience in different healthcare settings.

WP2 – Patient and stakeholder involvement in RiH

The purpose of WP2 is to describe how patients and stakeholders are actively involved in creating and sustaining RiH and how these practices can be supported and improved to facilitate high-quality healthcare. WP2 will employ a collaborative interactive research design involving patients, carers, healthcare professionals, regulatory bodies, the public and other major stakeholders (e.g. patient organizations, policy makers) as equal partners at all stages of the research process.[44]

Research question:
How can involvement of patients and stakeholders in RiH be described and improved?

Work tasks:

1) *Establish the current knowledge base on patient and stakeholder involvement (PSI) in RiH*
A scoping review of the literature will be conducted to establish the current knowledge on patient and stakeholder contributions to resilience in healthcare. The literature will be analysed according to how and in which healthcare settings different groups of patients and stakeholders contribute to resilience across different system levels.
2) *Conduct patient and stakeholder analyses in the core sample of empirical projects*
Within a sub-sample of empirical projects included in WP3, we will conduct systematic patient and stakeholder analyses[49] to generate knowledge about how relevant actors understand and articulate their interests, interrelations, agendas, and the influence or resources they bring to bear on RiH. The stakeholder analyses will form the basis for developing key principles for how the conceptual model for PSI in RiH can be co-produced and designed.
3) *Explore and develop a conceptual model for how PSI in RiH can be understood and improved*
A conceptual model for PSI in RiH will be developed by synthesizing results on how patients and stakeholders are involved and contribute to RiH in the sample of empirical projects included in WP3, and how the drivers for their involvement can be understood. Following the patient and stakeholder analyses conducted as part of work task 2, key actors will participate in a co-production process to develop the model by taking roles as panel members, user representatives, advisors or "co-researchers" (employed in part time posts). WP2 will collect data across the sample of empirical projects using multiple methods (WP3). Topics to be covered are situations where patients and stakeholders contribute to resilience, types of involvement, drivers and barriers to involvement, contextual issues, etc.
4) *Evaluate and refine the PSI in RiH model by using collaborative learning tools and innovations.* The conceptual model for PSI in RiH will be tested and validated through the development of a set of learning tools and innovations (e.g. "meeting arenas", simulation scenarios) in close collaboration with WP4. The co-production process described in work task 3 will continue to cover these issues.

Intended outcomes:
1) Conceptual model for patient and stakeholder involvement in RiH; and
2) Summary of patient and stakeholder analyses across different healthcare settings.

WP3 – RiH in Norwegian healthcare settings

The purpose of WP3 is to document adaptive capacities across the broad sample of empirical projects included in the research program, to conduct detailed analyses of selected projects, and based on this develop and implement measures for adaptive capacities in selected healthcare settings by means of patient and stakeholder involvement and collaborative learning.

Research question: How can RiH be described and improved in different healthcare settings?

Work tasks:

1) *Analyse the broad sample of empirical projects using a quality-resilience framework.* For the total sample of empirical projects (approximately 20 projects) a framework for analysis will be developed for establishing the relationship between adaptive capacities and healthcare quality dimensions, based on the Quality and Resilience Trigger Tool (see supplementary file), system levels, and empirical setting. The analytical framework will be applied on data collected using project documentation (e.g. publications, study protocols, reports, etc.), semi-structured interviews or focus group interviews with project researchers, or observation of project meetings, workshops, etc.
2) *Synthesize in-depth analyses of a sub-sample of empirical projects*. For a sub-sample of empirical projects deductive content analyses[50] will be synthesized across system levels and healthcare settings. The content analyses will be based on categories resulting from the meta-analysis in work task 1. Analytical workshops will be held with the respective project researchers and with patient

and stakeholder co-researchers to produce the synthesis. Results will be presented as a set of indicators for adaptive capacities at the micro, meso, and macro levels in close collaboration with WP1.

3) *Develop, implement, and evaluate RiH interventions.* Based on the synthesis produced in work task 2, a RiH intervention bundle (three to five measures) will be co-produced with the patient and stakeholder groups identified in WP2 using the collaborative learning tools established in WP4. The intervention bundle contents will be based on empirical evidence gathered in the analyses of work task 1 and work task 2 and will be implemented in three selected healthcare settings (micro, meso, macro). Possible impact of the RiH intervention bundle will be measured using a process evaluation approach.[51]

Intended outcomes:

1) Analytical framework for establishing the relationship between RiH and quality;
2) Meta-synthesis of adaptive capacities across different healthcare settings; and
3) RiH intervention bundle.

WP4 – Collaborative learning in RiH

The purpose of WP4 is to describe the relationship between collaborative learning and resilience to establish a framework that supports adaptive capacities across diverse healthcare settings and system levels. The collaborative learning framework will build on interactive, participatory, and reflexive approaches. In developing the framework, adjacent conceptual approaches will be consulted, e.g. the relationship-based approach.[52]

Research question: How can the role of collaborative learning in RiH be described and improved?

Work tasks:

1) *Establish the current knowledge base on collaborative learning in RiH.* A review of the literature will be conducted to provide an overview of the role of collaborative learning in current RiH studies. This literature will be analysed according to how learning is described in relation to resilience, where learning occurs, who is involved in learning situations, and how adaptive capacities are learnt, and that learning is enhanced through collaborative arrangements.
2) *Analyse data from the sample of empirical projects in WP3 to identify collaborative learning needs and pedagogically rich activities.* Collaborative learning needs and pedagogically-rich activities in healthcare settings will be synthesized across the empirical projects included in WP3. WP4 will collect data across the empirical projects using multiple methods (WP3). Processes appraised in these projects will include collaborative meetings, teamwork, learning arenas, learning resources, learning from positive situations, interfaces, participants, etc.
3) *Apply participatory design principles to develop and pilot-test a set of collaborative learning tools and components (CL framework) to support adaptive capacities.* In collaboration with WP2 and based on the learning needs and pedagogically-rich activities identified in WP3 analyses, participatory design processes will be run with the aim of developing the contents of, and the underlying principles of a CL framework. The contents of the framework will likely include learning tools such as structured meeting arenas, simulation scenarios, interactive digital guides, webinars, e-dialogue forums, etc. The underlying principles of the framework will address issues such as learning goals, participants, procedures, resources, etc.
4) *Implement and evaluate the CL framework in selected empirical settings.* The pilot-tested CL framework will be revised and subsequent trials implemented in three different empirical settings in collaboration with WP3; one focusing on healthcare professionals' individual and team-based adaptive capacities (i.e. micro-level), one focusing on organizational adaptive capacities (i.e. meso level), and one focusing on intra-organizational adaptive capacities (i.e. macro level). A RiH laboratory will be created to support the implementation. Possible impact of the CL framework

will be studied using a participant observation approach[53] as part of the process evaluation approach in WP3.

Intended outcomes:

1) Collaborative learning framework for RiH; and
2) Synthesis of learning mechanisms for adaptive capacities across different healthcare settings.

WP 5 – Cross-country comparative resilience studies

The purpose of WP5 is to conduct, analyse, and compare empirical studies in different countries to establish the cross-country characteristics of RiH and to explore under which conditions RiH is enacted in different countries. The cross-country RiH studies will be conducted in six countries; Netherlands, Australia, England, Switzerland, Japan, and Norway according to a joint study protocol.[38] The international study will follow a three-phased approach including mapping of country characteristics and sampling (Phase 1), within country data collection using observations and interviews (Phase 2), and cross-country comparative analysis (Phase 3). In Phases 2-3 WP5 will focus empirically and analytically on healthcare teams and how they communicate and co-ordinate to adapt and respond to challenges and problems.

Research question: How can RiH be identified, analysed and compared in different international settings?

Work tasks:

1) *Conduct an initial analysis of the healthcare systems* in the six countries. The analysis will be based on mapping and comparison of healthcare contextual issues such as funding and access, patient rights, regulatory framework, accreditation and monitoring, information availability, and resources available.
2) *Conduct exploratory empirical case studies of RiH* within selected healthcare settings in the six countries. This will involve interviews at different levels (i.e. micro, meso, macro) and observations of clinical work, team and managerial processes in pre-defined empirical fields. The aim will be to identify adaptive capacities across countries, system levels and empirical contexts.
3) *Conduct within-case analysis of RiH* in each country according to a joint protocol to determine adaptive capacities at micro, meso and macro levels in the selected empirical settings in each country. The 'within-case' analysis will result in six country-specific reports in English to enable cross-country comparison.
4) *Conduct cross-case analysis of RiH* to synthesize and compare findings across the six country reports using a common conceptual framework. Comparing results across multiple empirical settings, levels and countries will allow identification of differing adaptive capacities and how they are shaped by organizational, cultural, economic, and regulatory factors.
5) *To develop guidance* for policy makers, managers and practitioners for operationalizing and implementing RiH in different countries and organizational contexts. This will include developing freely accessible anonymized RiH case study summaries to inform further development of RiH studies and interventions, and to influence quality and safety programs internationally.

Intended outcomes:

1) Summary of healthcare system mapping across six countries;
2) Six country-specific reports on adaptive capacities across system levels;
3) Synthesis of RiH across six countries; and
4) RiH guidance for stakeholders in different countries.

Patient and public involvement

The RIH project integrates patient and stakeholder involvement throughout all research phases from project design, planning, data collection, analysis and publication. A specific work package (WP2) is set aside to assure involvement at all levels of the Norwegian healthcare system. A patient and citizen representative have been involved in the project development and is co-leading the international Expert Advisory Board established in the project. Co-researchers will be employed in different roles throughout the program.

ETHICS AND DISSEMINATION

Ethics

The RIH program is approved by Norwegian Centre for Research Data (No. 864334). Each individual study in the longitudinal research program constituting the empirical WP3 will apply for ethical approval from the Norwegian Centre for Research Data or the Regional Committees for Medical and Health Research Ethic. As different countries have different requirements for ethical approval of research studies, each study in the cross-country WP5 will apply for ethical approval in the respective country if required.

Dissemination

The RIH research program has a publication and dissemination strategy focusing on the sharing of scientific knowledge, information and results, and on public engagement from relevant patient and stakeholder representatives. The results from the research program will be disseminated through scientific articles, PhD dissertations, and presentations at national and international conferences, as well as in social media, newsletters, and in the press.

The research program will organize annual RiH research seminars for academic partners, empirical partners, and stakeholders. RiH consortium members, Expert Advisory Board members, and leading international researchers will be invited to present state-of-the-art research on Resilience in Healthcare. Annual RiH patient/stakeholder seminars will contribute to create a collaborative learning arena involving relevant stakeholders in the Norwegian healthcare system and RiH researchers, to enable translation of research evidence into interventions for stakeholder use. The RiH project will use new forms of virtual platforms to ensure continuous direct communication on a regular basis among the consortium partners. RiH will also take advantage of virtual share-points to enable the secure sharing of documents between partners.

Data statement The datasets generated during and/or analysed during the current research program are available from the corresponding author on reasonable request.

Acknowledgements We thank Roland Bal, Jeffrey Braithwaite, Mathilde Bourrier, Carolyn Canfield Mary Chambers, and Marianne Storm for their intellectual inputs to the grant application resulting in the RiH Research Program. We also thank Cecilie Haraldseid-Driftland for comments on an earlier draft of the protocol, and Janne Gro Alsvik for help in preparing the manuscript for submission.

Author contributions KA is the principal investigator of the research program and designed the overall research proposal, drafted the original manuscript and contributed to revisions and additions to the manuscript. SW and VG contributed with substantial intellectual contents in the design of the research program, drafted substantial parts of the original manuscript, and contributed to revision to the manuscript. SS, ON, OR, SB, TM, and JA contributed to the design of the research program, drafted parts of the original manuscript and contributed to revisions to the manuscript. All authors approved the final version of the manuscript.

Funding The RiH research program has received funding from the Research Council of Norway under the FRIPRO Toppforsk program, grant agreement no 275367. The University of Stavanger, Norway, the Norwegian University of Science and Technology in Gjøvik, and the Norwegian Air Ambulance Foundation support the program with in-kind funding.

Competing interests None declared.

Patient consent for publication Not required.

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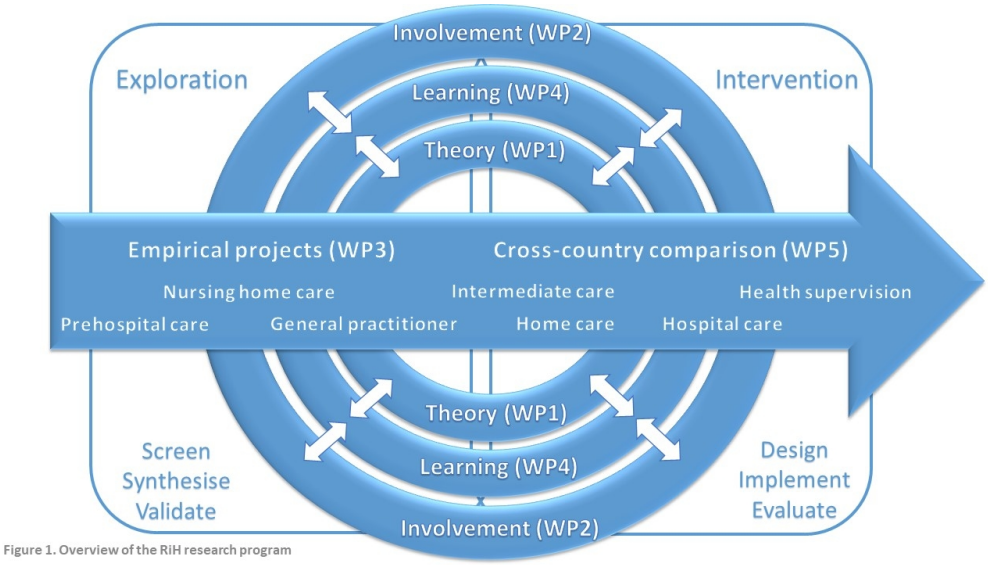

Figure 1. Overview of the RiH research program

Figure 1. Overview of the RiH research program

338x190mm (96 x 96 DPI)

Screening Protocol- Resilience in Healthcare (RiH)

Aim

Systematically go through all SHARE affiliated former (going back to 2010) and ongoing research projects to consider inclusion in the RiH research project according to "What is the essence of this research project? Is the focus here on quality and resilience? In what way is this project and its findings potentially relevant for the RiH project?"

1. **Determine which research projects have a SHARE affiliation**

   a) Search through the SHARE website, the SNLA website (projects from 2017 and onwards), the NTNU Gjøvik website (projects from 2015 and onwards), etc. for information on SHARE-affiliated research projects.

   b) Use SHARE documentation and conversations with key personnel, coordinators and/or contact persons with the three SHARE partners for quality assurance of affiliated projects.

2. **List all SHARE affiliated projects for initial screening**

   a) Search in Brage, Cristin and Google Scholar for relevant project information and outputs (PhD-theses, journal articles, protocols, etc.)

   b) Include all current, finished, and newly started SHARE projects in a screening table according to project title, affiliated researcher(s), project status (finalised, ongoing, start-up), empirical setting, clinical field, and/or stakeholders involved.

   c) Use conversations with key personnel, coordinators and/or contact persons with the three SHARE partners for quality assurance of the screening table.

3. **Initial screening of all SHARE research projects**

   Based on the list of project titles and belonging project information compiled during step 2, screen all projects for relevance to quality and resilience according to the *"RiH Quality & Resilience Trigger Tool"*.

   Mark projects in green if they are definitive (or highly likely) inclusions; mark projects in orange if further consultation of project documentation is needed; mark projects in red if they are not relevant for inclusion.

4. Second level screening of projects marked in orange

Second level screening of projects marked in orange based on the same information as in step 3, conducted by a second researcher. If necessary use additional information through other publicly available sources or seek access to approved project plans and/or protocols from involved researchers.

Mark projects in green if they are definitive (or highly likely) inclusions; mark projects in red if they are not relevant for inclusion. Mark projects in orange if still unsure of inclusion status and further consultation with collegaues is needed.

5. Group consensus process for final inclusion assessment

Any projects still marked in orange will require further assessment of inclusion in consultation with colleagues.

A group consisting of 5 members will be formed to establish consensus for final inclusion. The group will in their process also include impartiality discussions regarding the issue of conducting research on researchers according to the *"RiH impartiality principles"*.

Make final decision regarding inclusion/exclusion of projects marked orange, and document possible actions concerning impartiality.

6. Summary of final project inclusion

Summarize included projects according to quality and resilience relevance, project phase, empirical setting, clinical domain, and stakeholder groups.

RiH Quality & Resilience Trigger Tool

Aim

To screen SHARE-affiliated research projects' relevance according to the RiH project's focus on quality and resilience.

Triggers

First define how quality is addressed in the project (step 1), then how resilience plays a role in quality (step 2). NB! Resilience is related to actions, activities, processes ("Resilience as a verb")

1. Quality

Projects need to be marked for one or more of the four quality dimensions in order to move to step 2 on resilience.

Patient experiences, patient centeredness, patient involvement

Patient safety, risk, adverse events

Clinical effectiveness, treatment and care interventions, effects, patient outcomes

Care coordination, patient pathways, care transitions, integrated care, collaboration across service providers and care levels

2. Resilience

Adaptation, variation, trade-offs, improvisation, response, complexity

- Individual capacity (knowledge, competence, learning, personal characteristics, cognitive, behavioral strategies)
- Team/unit capacity (communication, collaboration, learning)
- Organisational capacity (resources, organization, culture)
- Larger system capacity (infrastructure, regulation, framework conditions)

Changes, challenges, disruption, development, improvement, success, enhancement, growth, recovery, transformation

Collaborative learning, work practice, teamwork, problem solving, interaction

Stakeholder actions, knowledge-brokering, co-creation, contribution, information, engagement