FINAL PUBLISHABLE SUMMARY

Background. Patient and population outcomes of healthcare for chronic diseases remain suboptimal, because available knowledge is not always used in clinical practice. Tailored implementation strategies are designed to achieve desired changes in healthcare practice based on an assessment of determinants of healthcare practice. Systematic tailoring entails three key steps: identification of the determinants of healthcare practice, designing implementation interventions appropriate to the determinants, and application and assessment of implementation interventions that are tailored to the identified determinants. Little research evidence is available regarding how tailoring is best done in relation to implementation of evidence-based practice.

Aim. The aim of the Tailored Implementation For Chronic Diseases (TICD) project was to develop valid and efficient methods of tailoring implementation interventions to determinants of practice for knowledge implementation in chronic illness care.

Methods. The TICD project organized the planned empirical research in three work packages that followed the three main steps of tailoring. The research targeted chronic conditions in five different healthcare systems: cardiovascular disease in the Netherlands, obesity in England, depression in Norway, chronic obstructive pulmonary disease in Poland, and multi-morbidity in Germany. Head-to-head comparisons of barrier identification methods and matching methods were conducted in each country for the targeted chronic condition. In the final piece of empirical research, five cluster randomized trials and an overall process evaluation, we assessed the effectiveness of the tailored implementation programs.

Results. The literature reviews provided insight into comparative research of tailoring methods (n=0 studies), an updated version of the Cochrane review of tailored implementation (n=32 trials), and a framework of determinants of practice (57 concepts in 7 domains). It compared interview and survey methods with stakeholders for the identification of determinants of practice and implementation strategies, showing that none of the methods provided a comprehensive list of items. Brainstorming proved to be a feasible and productive method. The 5 trials showed that tailored implementation improved several aspects of healthcare delivery, although not pre-defined primary outcomes. The use of implementation interventions was mixed, but overall moderate. The associated process evaluation largely confirmed the relevance of targeted determinants of practice as well as identified other determinants, which had not been identified or prioritized in earlier phases.

Discussion. The validity of the chosen tailoring methods (using interviews with stakeholders) was high, but the delivery of the resulting tailored interventions need to be improved to have higher impacts. The TICD project has explored a new set of methodological questions, internationally for the first time, which has advanced the science of implementing evidence-based practice substantially.

1. Project context and the main objectives

Aim and objectives of the TICD project

The aim of the TICD project was to develop better methods of tailoring implementation interventions to barriers and enablers for knowledge implementation in chronic illness care.

The TICD project focused on tailoring implementation interventions in chronic illness care, assuming that implementation interventions are most beneficial if they effectively address the most influential barriers and enablers for implementation. Empirical evidence for any method or model for tailoring implementation interventions is, as yet, very limited. The implementation of evidence-based health interventions into routine health service provision is a largely pragmatic field of activity, which has resulted in little cumulative learning. Standardized methods and models are needed to build on, and add to, previous studies of implementation interventions. Head-to-head comparisons of alternative methods and models for tailoring are needed to increase our understanding of implementation processes in chronic illness care and to provide practical guidance to planners of implementation interventions.

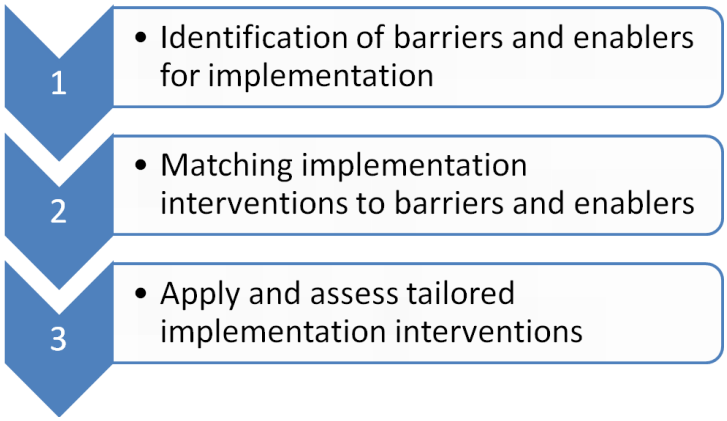
Four key objectives were defined:

1 To review research evidence regarding methods and models for tailoring knowledge implementation for chronic illness care.
2 To test different methods and models for identifying barriers and enablers for improving chronic illness care.
3 To test different methods and models for matching implementation interventions to identified barriers and enablers for improving chronic illness care.
4 To assess the effectiveness of tailored implementation interventions in chronic illness care and the mediating and moderating role of hypothesized barriers and enablers.

Rationale for tailoring knowledge implementation

"Tailoring" implies that implementation interventions are not chosen a priori and not necessarily standardized across all targeted healthcare settings and professionals. Instead, the choice of implementation interventions, and their content, is based on an assessment of barriers and enabling factors, and may thus differ across different healthcare organizations or groups of health professionals (although it may be consistent within one project). Tailoring is what happens in most implementation programs, even if this was not explicitly planned. For instance, professional education may be provided, if insufficient knowledge of new practices is a problem; and interventions to improve teamwork may be applied, if coordination problems in healthcare delivery were found. In many situations, a combination of interventions is applied, so that many tailored implementation interventions are complex interventions. Systematic tailoring has three key steps: identification of barriers and enablers for implementation, matching implementation interventions to barriers and enablers, and application and assessment of tailored implementation interventions (Figure 1).

Figure 1: Key steps in tailoring implementation



Many differences emerge when the different approaches to tailoring implementation interventions are examined in more detail. Some approaches to tailoring are largely explorative, while other approaches are based on specific theoretical perspectives. Some approaches to tailoring use a systematic procedure that seeks generaliziability while other approaches are empirical with limited or no generalization. The level of aggregation for tailoring differs. Tailoring may be applied at the level of health professionals, patient care teams, healthcare organisations, or implementation projects. A range of specific methods and models are available for the different steps in tailoring, as will be outlined in the following sections. It is unclear which ones are most appropriate. Likewise, it is unknown whether the explicit use of theory on change of behavior and organizations increases the effectiveness of tailoring of implementation interventions. And if so, what theory is most helpful in different situations. A wide range of theories is available and personal preference rather than research evidence seems to guide the choice of theory. So, little is known about the validity and effectiveness of different methods and models of tailoring. It is exactly this area of controversy that is addressed by the TICD project.

Methods and models for identifying barriers and enablers

A wide range of methods can be used to identify barriers and enablers for improvement. These can be distinguished in two broad categories: explorative methods and theory-orientated models. It is currently unclear which methods and models are most valid.

Exploratory methods. Different exploratory techniques can be used to identify barriers and enablers. The following methods have probably been used most frequently:

- Brainstorming: a group of people brought together to generate ideas about a specific topic.
- Case studies: comprehensive description and analysis of a specific past situation, event or case – usually involving a variety of data collection techniques.
- Key informants: individuals who understand and have significant insight into a particular problem or situation, usually their views are sought through information conversations.
- Interviews: face-to-face or telephone discussion where individual participants are asked specific questions by an interviewer.
- Focus groups: a facilitated discussion among a group of people in which a moderator uses open-ended questions to encourage discussion of a particular topic or issue.
- Direct observation: watching and listening to interpersonal interactions, events or activities in a given setting.

- Surveys: a standardised set of questions assessing participants' knowledge, attitudes and/or self-reported behaviour – usually administered via mail.
- Nominal group technique: a highly structured discussion among a group of people where ideas are pooled and prioritised.
- Delphi technique: an iterative process in which information is collected from the same group of participants through a series of surveys.

Theory orientated models. Alternatively, it may be helpful to consider specific factors that have been suggested by theories of change, particularly if the theories are supported by empirical evidence and if valid measurement instruments for the factors are available. The advantage would be that these factors are not overlooked in the identification of determinants of change.

Methods and models for matching implementation interventions to barriers and enablers

After barriers and enablers for knowledge implementation have been identified and prioritized, the logical next step is to match implementation interventions to these barriers and enablers. This is the step for which methods and models have been least well developed. One of the aims of the TICD project is to address this lack of methods and models.

Exploratory methods. Exploratory methods are mainly based on brainstorming. This is a method that helps a group to identify as many solutions as possible to a problem. The underlying assumption is that quantity leads to quality; the more solutions the greater the chance there is a good one among them. An alternative to the traditional brainstorming is electronic brainstorming, allowing members to enter their ideas anonymously while providing for the anonymous distribution of ideas to all participants. Many pragmatic approaches to the selection of implementation interventions use an implicit type of brainstorming.

Theory-based methods. While systematic methods for developing interventions on the basis of theory are available, we do not know if such a method would indeed increase the success of interventions. A common sense use of theories would be to consider the chosen objectives and decide what interventions various theories suggest to influence the determinants of change. The process usually includes the use of an explicit framework and stepwise approach. This may be used in a group, so that the approach may look similar to the exploratory method described above.

Review of the effectiveness of tailored implementation interventions

A Cochrane review on the effectiveness of tailored interventions found that such interventions can indeed be effective, but they were not consistently so meta-analysis indicated that tailoring tends to be more effective than no intervention, but as yet evidence is limited on precisely which approaches to identifying barriers and tailoring of strategies are most likely to be effective in different clinical circumstances. The methods and models of tailoring, which were used in these trials, were highly heterogeneous.

Challenges of improving chronic illness care

The TICD project focused on implementation processes in chronic illness care. Chronic diseases (such as asthma, chronic heart failure, and depression) have a major impact on both individuals and societies. Chronic disease represents one of the most important challenges facing healthcare systems. Chronic diseases are most prevalent in the poor, and in low and middle income countries.

Men and women are affected equally. Not only elderly people are affected: half of the individuals with chronic diseases are under the age of 70 years. The TICD project focuses on what healthcare can do to improve survival, quality of life, and economic productivity of people with chronic diseases. Studies of chronic disease care in many countries have repeatedly shown that health care delivery is not consistent with evidence-based recommendations for treatment of people with chronic conditions.

Given these gaps in the provision of healthcare to patients with chronic conditions, there is an urgent need for better understanding of implementation processes in chronic illness care in order to improve the uptake of knowledge in routine healthcare delivery and thus to improve its outcomes. While each chronic disease and each healthcare system have unique characteristics, there are a number of characteristics which are shared across chronic conditions and healthcare systems:

- Most chronically ill patients receive most of their healthcare in ambulatory and primary care settings. In many European countries, this is provided by self-employed health professionals, who are based in relatively small organizations. In addition, patients may attend hospital for specific diagnostic tests, specialized treatment, or emergency care.
- Evidence-based clinical practice guidelines are available for many chronic diseases. They provide recommendations on safe and effective diagnosis, treatment, counseling, and monitoring. The guidelines need to be updated regularly in order to keep up with the developing clinical evidence. Health professionals face the challenge to implement these continuously developing clinical guidelines in their professional behavior.
- Health care increasingly needs to address the management of individuals with multiple coexisting diseases. Adhering to present clinical practice guidelines for single diseases may have adverse effects in the care of patients with multimorbidity.
- A patient's experience of chronic disease is not static and so health care systems need to be flexible enough to change care in response to changing patients' needs. For instance, the emphasis is on self-management and screening in early stages of a disease, monitoring and secondary prevention in established disease, tertiary prevention and palliative care in end stages of a disease.
- Chronic illness care has to be provided over a long period of time and it usually involves a team of health professionals. This poses challenges for the coordination and continuity of care.

2. Scientific and technology results/foregrounds

The TICD project had four work packages that were focused on scientific work. These will be presented consecutively.

1.Literature reviews

A wide range of methods can be used to identify determinants of practice for improvement. These can be distinguished in two broad categories: explorative methods and theory-orientated models. It is currently unclear which methods and models are most valid. Different exploratory techniques can be used to identify determinants of practice. The following methods have probably been used most frequently:

- Brainstorming: a group of people brought together to generate ideas about a specific topic.

- Case studies: comprehensive description and analysis of a specific past situation, event or case – usually involving a variety of data collection techniques.
- Key informants interviews: individuals who understand and have significant insight into a particular problem or situation, usually their views are sought through information conversations.
- Participant interviews: face-to-face or telephone discussion where individual participants are asked specific questions by an interviewer.
- Focus groups: a facilitated discussion among a group of people in which a moderator uses open-ended questions to encourage discussion of a particular topic or issue.
- Direct observation: watching and listening to interpersonal interactions, events or activities in a given setting.
- Surveys: a standardised set of questions assessing participants' knowledge, attitudes and/or self-reported behaviour – usually administered via mail.
- Nominal group technique: a highly structured discussion among a group of people where ideas are pooled and prioritised.
- Delphi technique: an iterative process in which information is collected from the same group of participants through a series of surveys.

Aims

The overall aim of the systematic reviews in work package 1 was to review research evidence regarding methods and models for tailoring guideline implementation by conducting three related, but separate systematic reviews, with these objectives:

1. To develop a taxonomy for determinants of practice that can be used internationally to facilitate reporting and interpretation of implementation research.
2. To identify and describe research on methods used to identify determinants of practice and their advantages and disadvantages.
3. To describe approaches used to match implementation interventions to determinants of practice and their advantages and disadvantages.

Checklist of determinants of practice

Determinants of practice are factors that might prevent or enable improvements. Several checklists, frameworks, taxonomies, and classifications of determinants of healthcare professional practice have been published. We describe the development of a comprehensive, integrated checklist of determinants of practice (the TICD checklist).

We performed a systematic review of frameworks of determinants of practice followed by a consensus process. We searched electronic databases and screened the reference lists of key background documents. Two authors independently assessed titles and abstracts, and potentially relevant full text articles. We compiled a list of attributes that a checklist should have: comprehensiveness, relevance, applicability, simplicity, logic, clarity, usability, suitability, and usefulness. We assessed included articles using these criteria and collected information about the theory, model, or logic underlying how the factors (determinants) were selected, described, and grouped, the strengths and weaknesses of the checklist, and the determinants and the domains in each checklist. We drafted a preliminary checklist based on an aggregated list of determinants from the included checklists, and finalized the checklist by a consensus process among implementation researchers.

We screened 5,778 titles and abstracts and retrieved 87 potentially relevant papers in full text. Several of these papers had references to papers that we also retrieved in full text. We also checked potentially relevant papers we had on file that were not retrieved by the searches. We included 12 checklists. None of these were completely comprehensive when compared to the aggregated list of determinants and domains. We developed a checklist with 57 potential determinants of practice grouped in seven domains: guideline factors, individual health professional factors, patient factors, professional interactions, incentives and resources, capacity for organisational change, and social, political, and legal factors. We also developed five worksheets to facilitate the use of the checklist.
Based on a systematic review and a consensus process we developed a checklist that aims to be comprehensive and to build on the strengths of each of the 12 included checklists. The checklist is accompanied with five worksheets to facilitate its use in implementation research and quality improvement projects.

Systematic review on methods to identify determinants for practice
Our objective was to provide evidence for the validity, feasibility and effectiveness of methods for tailoring implementation interventions, both for identification of determinants of practice and for matching interventions to determinants.
We included both descriptive and evaluative studies of methods to identify determinants of practice to changing health professional practice in healthcare. We included studies regardless of the clinical problem. We focused on comparative studies using more than one method. We used text words and index terms from published papers that we already had on file and collaborated with a research librarian familiar with literature searches in this field to construct search strategies for Medline, Cochrane Methodology Register, CINAHL, PsycINFO Sociological Abstracts and ISI Web of Knowledge. We conducted citation searches (ISI and Google) and search for related articles in PubMed using key background papers and relevant included studies, and we hand searched Implementation Science and BMJ Quality and Safety. We had 4997 records from searches for studies of methods for identifying barriers and enablers to changing practice. We screened all 5778 titles and abstracts. We identified more than 400 descriptive studies on methods to identify determinants of practice. We also checked potentially relevant papers we had on file that were not retrieved by the searches.
We did not identify any comparative studies of the advantages and disadvantages of different methods used to identify determinants of practice. We identified a large number of studies that describe the identification of determinants of practice. They used different methods such as literature reviews , record reviews or audits (gap analysis), interviews with experts in the field, practitioners or patients, focus groups, surveys (web-based and mailed), observations and informal discussions or brainstorming. We found no studies that compared or evaluated the use of these methods. There was little information about why a particular method was chosen or how the content of the interview or survey was determined. In studies that used more than one method, the focus was on the determinants that were identified, not on the advantages and disadvantages of the different methods that were used.
The conclusion is that research evidence from comparative studies on the usefulness of tailoring methods is lacking.

Systematic review of randomized trials
This review focused on randomised controlled trials of tailored interventions to implement improved health care. The review is an update of a published Cochrane review. Tailored implementation is

defined as ‘strategies to improve professional practice that are planned taking account of prospectively identified determinants of change’. The previous version of this review reported that this approach can be effective, although the methods of tailoring were not well developed.
Our objective was to determine whether tailored strategies are effective in improving professional practice and health care outcomes.
Only cluster randomised controlled trials were included. Detailed searches of bibliographic databases were undertaken to identify articles reporting studies potentially eligible for inclusion. Two reviewers independently assessed potential articles, selecting those that met our inclusion criteria. Data extraction was undertaken by two reviewers independently. Extracted data were loaded into tables and the findings summarised.
A total of 32 randomised trials were included in the review (26 trials had been included in the previous version of the review). Seventeen studies compared tailored interventions to no intervention, and of these, 15 reported significant changes in care in comparison with the control group for at least one primary outcome. Fifteen studies compared a tailored intervention to a non-tailored intervention, for example, the dissemination of educational materials or guidelines, and of these studies, 11 reported significant changes in at least one primary outcome compared to the control group.
Tailored implementation interventions can be more effective than either no intervention, or to interventions that have only limited effect, such as dissemination of educational materials. However, the included studies used different methods of identifying the determinants of practice and different approaches to tailoring interventions to address the determinants. The methods to be used in undertaking tailored implementation require further development, and studies of costs-effectiveness are required.

2.Identification of determinants of practice

In work package 2, the aim was to investigate methods used to identify the barriers and enablers to implementation, in order to provide recommendations for researchers and practitioners on how to make tailored implementation more successful.

Aims

After description of the gaps or deficiencies in care for the studied chronic conditions (inventory of current practice) and selection of methods for identifying barriers and enablers for investigating, we undertook a comparative evaluation of the selected methods. The aim was to investigate the extent to which the methods identified important determinants and assess their feasibility in use. In particular, we first aimed to compare the extent to which brainstorming, health professional and patient interviews led to the identification of determinants judged to be important, and secondly to determine the additional value of structured group discussions and open questions in surveys of health professionals in identifying further determinants. We also investigated the role of closed questions, derived from the checklist in a questionnaire to samples of health professionals, in identifying the extent to which selected determinants were commonly reported.

Methods

The study was an evaluation of five methods of identifying determinants: brainstorming, interviews of health professionals, interviews of patients, structured group discussions with health professionals, and questionnaires for health professionals. Samples of healthcare and public health

professionals and patients were invited to take part. The samples included health professionals targeted by the clinical recommendations (obesity—general practitioners, practice nurses, dieticians; COPD—general practitioners, practice nurses, pulmonologists; depression in the elderly—physicians or nurses from primary care and psychiatrists and specialist nurses from specialist healthcare; polypharmacy in multimorbidity—GPs and healthcare assistants; cardiovascular risk management—GPs and practice staff). The patients currently had, or had previously had, the chronic condition of interest. We aimed to include patients at different stages of the condition, different ages, gender and social status. The sample sizes were chosen on largely pragmatic grounds, to enable both diversity of participants and the numbers that would typically be manageable in an implementation project.

Each country used all five methods to identify the determinants of practice for the chronic condition they were addressing. 1. Brainstorming with health professionals (two sessions with between 6 – 10 participants per country), 2. Structured group discussions after brainstorming with health professionals (two sessions with between 6 – 10 participants per country) 3. Interviews of health professionals (a minimum of 8 participants per country) 4. Interviews with patients (a minimum of 8 patients per country) 5. Questionnaire survey of health professionals based on the checklist derived from previous work within the TICD team (120 participants per country).
The principal measure used to evaluate methods for identifying determinants was the number of plausibly important determinants identified by each method. Plausibly important determinant was defined as 'a factor for which there was a consensus in the national research teams that it would firstly have more than a small effect on performance, and secondly, it was possible to address the determinant in the context of a practical implementation intervention.

Results

Seventy-two health professionals (between 10 and 18 in each country) participated in the brainstorming and structured group discussions, 49 health professionals (between 8 and 16 in each country) took part in health professional interviews, 32 patients (4–8 per country) took part in the patient interviews, and 514 (67–242) health professionals completed questionnaires.

The number of plausibly important determinants identified varied according to country. Norway and Germany identified the greatest number of plausibly important determinants (167 and 155 respectively) while Poland identified only 31. Despite Germany identifying a large number of plausibly important determinants, only 11 were classified as unique (i.e., identified by only one method), although in the other countries a third or more determinants were classed as unique.

Comparison of brainstorming, health professional interviews and patient interviews

Brainstorming and health professional interviews identified the greatest number of plausibly important determinants, with brainstorming identifying more than three times as many determinants as patient interviews (Table 1). Of the unique determinants, 51.8% were identified by brainstorming, 34.5% by health professional interviews, and 13.7% by patient interviews. In all countries, more than half the determinants were identified by more than one method, although more than one third were classed as unique in Norway, the Netherlands and the UK.

Table 1. Comparison of three methods for identifying plausibly important determinants (brainstorming, health professional interviews and patient interviews)

	Number of determinants not identified by any other method (unique determinants)	Number of determinants Identified by at least one other method*	Total
Brainstorming amongst health professionals	72 (37.2)	122 (62.8)	194 (100)
Health professional interviews	48 (31.6)	104 (68.4)	152 (100)
Patient interviews	19 (30.2)	44 (69.8)	63 (100)

Additional value of the structured focus groups and questionnaire open questions

Both structured group discussions following brainstorming, and, to a lesser extent, open questions in a survey, identified additional plausibly important determinants. Both methods contributed unique determinants, although relatively few were identified by the open questions.

Closed questions for each recommendation

Five closed questions were used per recommendation in each country. Respondents indicated that most of the recommendations were implementable, with the exception of recommendation one for the UK and recommendations three and six for Norway.

Feasibility

Recruiting participants

Successful recruitment of healthcare professionals and patients for interviews varied between the participating countries, but was assisted by the presence of networks of practices interested in research, as in Germany and the UK. In some instances, the recruitment of GPs proved difficult due to their busy workloads, and the absence of financial incentives seemed to further contribute to the difficulty in those countries in which reimbursement for professionals' time was not available. Moreover, paper based invitations to participate were less effective than electronic communications. The Norwegian team faced difficulties recruiting patients who were able to discuss their illness and how it related to the recommendation, possibly because of cognitive difficulties or because the recommendations or the task were not presented to the patients in an understandable way.

Interviews of professionals and patients

Generally positive attitudes were expressed by each of the participating teams towards the use of interviews as they appeared to yield more in-depth findings than that of questionnaires. Some felt that those healthcare professionals who agreed to participate were the most enthused and engaged with the topic area and so provided the most significant feedback. There were significant time costs associated with the transcription and analysis of each of the interviews as well as the time implications with the interviews themselves. The diaries showed that interviews required the most time of all the methods.

Brainstorming and structured group discussions

The methods yielded a wide array of issues associated with each of the chronic conditions, and they informed the interview schedule design, which enabled the key topics to be further explored and reinforce the opinions expressed in the group sessions. Some of the participants were familiar with the methodology, and, in the opinion of some research teams, these methods together yielded the

most important plausible determinants. However, some felt the initial silent phase in the brainstorming groups was artificial and often informal discussions broke out regardless of protocol. The transcription and analysis of the group sessions took time, but given that each team ran only two group sessions in comparison to several interviews, the time costs were not as large as with the interviews.

Questionnaires

Each of the participating countries experienced significant problems with the questionnaire, and arguably out of each of the methods it was regarded as the most problematic. Firstly, there were problems in achieving adequate response rates, exacerbated by the use of paper based questionnaires when necessary instead of electronic questionnaires. The Norwegian team was unable to obtain email addresses from various healthcare professional organisations due to data protection issues, and so was reliant on paper-based questionnaires. The paper based questionnaires together with follow up reminder letters were costly.

Summary

Brainstorming with health professionals is a preferred method to use since it has been shown to identify large numbers of plausibly important determinants for different chronic conditions in different countries. It may be usefully supplemented by a focus group phase to the group meeting. This approach is relatively easy to organise in most cases, and is relatively low cost. It should be noted, however, that a well-managed, structured process should be used, supported by careful selection of participants, detailed preparation, and thorough analysis of the findings.

Open questions in questionnaires perform relatively poorly, and can be time consuming to analyse. Therefore, this method should not be used routinely. Patient interviews also fail to identify large numbers of plausibly important determinants of improving chronic illness care. Unless there are reasons to suspect that patient factors play a large role in determining performance in a specific context, this method may be omitted.

Health professional interviews performed variably, but overall reasonably well, although did not identify as many plausibly important determinants as the brainstorming/focus group combination in most countries. However, for some topics, interviews of health professionals may be necessary.

The plausibly important barriers and enables have been categorised according to the factors in the checklist, which we developed in work package 1 of the TICD project. Determinants were reasonably spread over all pre-defined domains in the checklist in all projects and for all methods. Thus there is no evidence for specific methods towards specific types of determinants of practice.

3.Identification of strategies for implementation

Tailored strategies to implement evidence-based practice can be generated in several ways. In this study, we explored the usefulness of group interviews for generating these strategies, focused on improving healthcare for patients with chronic diseases.

Study aims

In this work package study, we assessed the usefulness of group interviews with stakeholders in terms of numbers and use of suggestions and the added value of different stakeholder groups and interview techniques. Group interviews were chosen, because these were perceived by the research team as potentially valid and feasible methods for generating ideas. The main objectives of the study

were (a) to compare the number and types of strategies generated by different stakeholders in brainstorm sessions, (b) to assess the added value of a structured group interview after brainstorming, (c) and to assess whether stakeholders provided strategies that were actually included in tailored intervention programs, which were subsequently tested in cluster randomized trials. Subsequently, we assessed the types of the strategies based on the framework of determinants of practice with seven domains.

Methods

A prospective observational study was conducted in five countries: Germany, the Netherlands, Norway, Poland and the United Kingdom (UK). Group interviews with relevant stakeholders were done in the autumn of 2012 based on a written study protocol, which was developed by the group of authors. In each country, the study involved at least four different categories of stakeholders. Convenience sampling (using a variety of methods) was used to purposefully recruit by mail or email different categories of individuals into groups. Category 1 consisted of healthcare researchers, including members of the TICD project teams and other healthcare researchers. Category 2 comprised quality improvement officers: individuals who develop or coordinate continuing medical education and quality improvement for the targeted patients, professionals or healthcare sector workers. Category 3 comprised healthcare professionals like primary care physicians and primary care nurses. For category 4 authorities, health insurers or other purchasers of healthcare were invited. Additionally, the country research team could decide to include extra group interviews. A fifth category comprised patients and/or relatives. These were only included in the Netherlands and Norway.

The group interviews followed a standardized procedure, although the content of the questions and responses differed across countries, depending on the clinical condition and the healthcare system. The interviews consisted of a brainstorming phase followed by a structured interview phase; for each phase one hour was indicated. A group moderator gave an oral presentation at the start of the brainstorming and at the start of the structured interviews. The moderator, who was experienced in leading a group interview, led the interview and took care that the groups did not focus on study designs, research methods or outcome measures. An observer (present in some countries) recorded all strategies, made field notes and added question prompts as needed.

In each country, the national research team listed the strategies in a structured document and translated these into English. These data were sent to the Dutch team which transferred them into a standardized data file for further analysis. The different research teams checked and approved the results of the different phases in this research.

Results

Overall 25 group sessions were held in five different countries involving 127 individuals. Groups varied in size from 3 to 9 participants and the group interviews lasted on average 112 minutes (range 67 – 135 minutes). During brainstorming a total of 881 unique strategies were generated and the structured interviews provided a total of 225 additional unique strategies. Overall, the participants generated a total of 1106 unique strategies. The differences in the numbers of strategies were larger between countries than between groups within a country (Table 2).

Table 2. Numbers of strategies provided in brainstorm phases and structured phase

	Brainstorm phases	Structured phase			
	Number of crude and unique strategies $	Crude number of strategies	Unique strategies within this group and phase	Additional unique strategies suggested in structured phase compared to brainstorm phase per group (% of all unique strategies in structured phase)	Total of unique strategies per group per country
Healthcare researchers					
Germany	38	8	8	7 (88%)	45
Netherlands	20	28	14	12 (86%)	32
Norway	35	-	-	-	35
Poland	18	17	17	0 (0%)	18
UK	49	16	16	8 (50%)	57
Quality improvement officers					
Germany	33	5	5	4 (80%)	37
Netherlands	19	27	27	27(100%)	46
Norway	99	-	-	-	99
Poland *	21	21	21	0 (0%)	21
UK	22	7	7	7 (100%)	29
Healthcare professionals					
Germany	21	12	12	12 (100%)	33
Netherlands **	36	76	55	55 (100%)	91
Norway **	120	-	-	-	120
Poland	8	8	8	0 (0%)	8
UK **	81	23	23	23 (100%)	104
Authorities, health insurers, other purchasers of healthcare					
Germany	32	9	9	9 (100%)	41
Netherlands	24	35	22	22 (100%)	46
Norway	93	-	-	-	93
Poland	13	14	13	1 (7%)	14
UK	28	13	13	3 (23%)	31
Patients and relatives of patients					
Netherlands **	36	42	37	35 (95%)	71
Norway	35	-	-	-	35
Total	881	361	307	225	1106

Legend: *individual interviews, ** two groups interviewed, $ crude items equaled unique items in the phase. Totals in brainstorm per country: Germany n=124 , Netherlands n=135, Norway n=382, Poland n=60, UK n=180.

Comparison of number of strategies between stakeholders

Focusing on the crude number of strategies generated during brainstorming, healthcare professionals provided most strategies in three countries: the Netherlands (n=36, 36% of all strategies in this country), Norway (n=120, 34%), UK (n=81, 45%). Healthcare researchers provided most strategies in Germany (n=38, 31%) and in Poland (n=18, 46%).

Comparison of type of strategies between stakeholders

Table 3 summarizes the type of strategies suggested. The types of strategies from brainstorming did not systematically differ between stakeholder groups within each of the countries, except for the Netherlands (X^2 (15, n=99) = 35.693 p=0.002). In this country, quality improvement officers mentioned more strategies aimed at the individual professional, while the healthcare professionals

mentioned more strategies aiming at patients factors. There were no significant differences regarding types of strategies from the structured phase in any of the participating countries. This analysis was performed post hoc and for each country results of brainstorming and structured interviews (except Norway) were analyzed separately (a total of 9 statistical tests).

Table 3. Summary of themes in the items for improving healthcare, mapped onto TICD framework domains

	Themes
Guideline factors	-summary version of guidelines -protocols tailored to local conditions -more specific clinical recommendations -cost analysis included in guidelines
Individual health professional factors	-content of education -delivery format of education -interventions to enhance the impact of education -enhanced use of information technology -free up time for healthcare professionals -revision of professional roles -making organizational changes -enhanced collaboration with other care providers
Patient factors	-delivery formats of patient education -use of counseling techniques -more active patient involvement -involvement of relatives and organizations -improved accessibility of services
Professional interactions	-local availability of care providers -enhanced communication and teamwork -involving others in detection of disease -use coordination mechanisms -change role perceptions regarding collaboration
Incentives and resources	-overall increase of reimbursement for care providers -supply of specific staff or devices -reimburse specific items -financial incentives for patients
Capacity of organizational change	-anchoring in administrative organization -more resources
Social, political, and legal factors	-publicity for healthcare providers

Number of strategies added in structured interviews

For this analysis we focused on the unique strategies that were identified during brainstorming and the structured interviews. Brainstorming generated 8 to 120 unique strategies per group; the structured interviews added 0 to 55 unique strategies. The highest numbers of additional strategies in the structured interviews of all groups together were found in the Netherlands (n=116, 54% of all unique strategies in this country) and UK (n=41, 19%). In Germany 32 (21%) unique strategies were added to the unique strategies of the brainstorming. In Poland only one (2%) additional item was made during the structured interviews.

Use of strategies in intervention programs

In each country all groups mentioned strategies which contributed to the tailored intervention programs. Strategies which were incorporated in the intervention programs were mostly mentioned during brainstorming, except in the Netherlands. All components of the tailored intervention

program were derived from the many mentioned strategies during the group interviews. Researchers were the first group who took part at the group interviews and they mentioned all the components that were incorporated into the intervention programs in three countries: Germany (6 out of 6), Norway (6 out of 6) and Poland (4 out of 4). The other stakeholders mentioned also some of the components in those countries. Not all the components of the intervention program were mentioned by the researchers in the Netherlands and the UK. In the Netherlands the researchers mentioned strategies contributing to five out of the seven elements in the intervention program. The contribution of the other stakeholders resulted in one additional element in the program. The researchers of the UK team mentioned four of the five elements of the intervention program. The other stakeholders didn't mention additional elements for the intervention program.

Summary

In this study, we explored the usefulness of group interviews for generating these strategies, focused on improving healthcare for patients with chronic diseases. Participants included at least four categories of stakeholders (researchers, quality officers, health professionals and external stakeholders) in five countries. Interviews comprised brainstorming followed by a structured interview, and focused on difference chronic conditions in each country. We compared the numbers and types of strategies between stakeholder categories and between interview phases. We also determined which strategies were actually used in tailored intervention programs.

In total 127 individuals participated in 25 group interviews across five countries. Brainstorming generated 8 to 120 strategies per group; structured interviews added 0 to 55 strategies. Healthcare professionals and researchers provided the largest numbers of strategies. The type of strategies for improving healthcare practice did not differ systematically between stakeholder groups in four of the five countries. In three out of five countries, all components of the chosen intervention programs were mentioned by the group of researchers. Group interviews with different categories of stakeholders produced many strategies for tailored implementation of evidence-based practice, of which the content was largely similar across stakeholders.

4.Evaluation of tailored implementation strategies

In Work Package 4, which is the focus of this section, five tailored intervention programs were developed and their effectiveness on implementation of recommendations for chronic illness care was evaluated in five separate randomized controlled trials. A comprehensive process evaluation was conducted in all trials to assess the validity of the methods used for tailoring. To make efficient use of the full number of cases, common frameworks were used for the process evaluation in all trials.

Selection of implementation interventions

All research teams ranked the strategies identified in WP3 according to the criteria "feasibility" and "assumed impact" by means of a point score, expressing high / low feasibility and high/low impact. This quantitative ranking was followed by a discussion among the research teams, in which discrepancies were resolved and the decision about the strategies finally to be used in the implementation intervention was made.

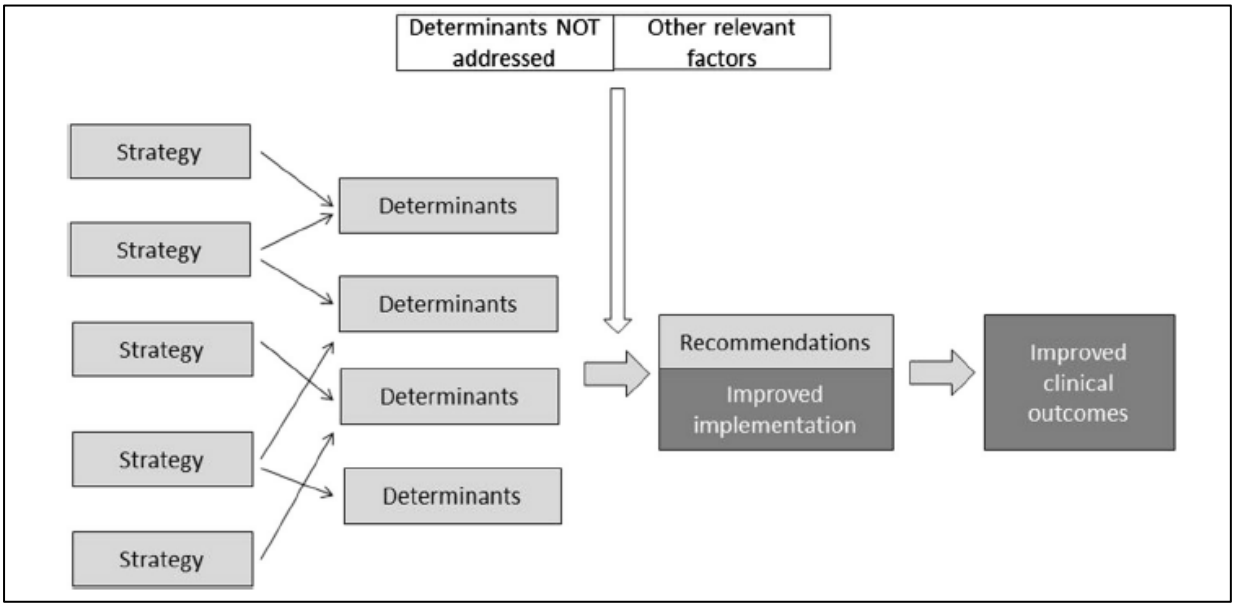
Research protocols

After the selection of the strategies to be used in the implementation programs, detailed interventions including an evaluation plan were developed. The effectiveness of the interventions was evaluated in five randomised controlled trials. For each trial a comprehensive protocol, following

the CONSORT statement for reporting randomized controlled trials, was elaborated and published. All trial protocols were registered in acknowledged study registries and approved by ethical committees.

In order to guide the evaluations within and across the five trials, the “logic model” of each implementation intervention was included into the study protocols. Figure shows the scheme, which the logic models of all trials followed. It outlines the connection between the strategies used, the determinants intended to be addressed and the implementation objectives.

Figure 2: Scheme of the "logic models" specified for each of the five interventions



Additionally, a common protocol for a comprehensive process evaluation across all five trials was developed and published. The aim of the process evaluation was to examine the validity of the tailoring methods applied in WP2 and WP3 and to analyse the association of implementation activities and the effectiveness of the program.

A tailored program to implement recommendations for multimorbid patients receiving polypharmacy into primary care practices (Germany)

The German trial focused on patients with multimorbidity. Polypharmacy – a major challenge of multimorbidity – was selected as quality improvement target. Three recommendations focussing on the management of polypharmacy (defined as the permanent intake of more than four drugs) in primary care were identified and chosen as implementation objectives. The primary outcome of this study is the degree of implementation of the three recommendations assessed by a set of indicators reflecting professional behaviour. Results suggested improvement on the primary outcome (table 4) but not on secondary outcomes (table 5).

Table 4. Mean of the primary outcome (Germany; n=273)

Pseudonym GPs	Summary outcome at Baseline (%)	Summary outcome at follow-up (%)
Control	27,16 (SD 10,64)	20,39 (SD 9,31)
Intervention	25,63 (SD 17,57)	39,16 (SD 12,77)

Table 5. Means and standard deviations of secondary patient outcomes (Germany)

	Baseline		Follow-up	
	Control	Intervention	Control	Intervention
PAM *	3,32 (SD 0,46)	3,27 (SD 0,49)	3,29 (SD 0,46)	3,33 (SD 0,48)
BMQ ** Scale "necessity"	4,47 (SD 0,55)	4,21 (SD 0,59)	3,30 (SD 0,61)	3,26 (SD 0,61)
BMQ Scale "fears" ***	2,41 (SD 0,89)	2,52 (SD 0,89)	1,44 (SD 0,84)	1,82 (SD 0,92)
MARS ****	22,92 (SD 2,96)	23,26 (SD 2,33)	23,31 (2,56)	22,34 (SD 2,38)

* higher values indicate higher self-efficiency. ** higher values indicate a stronger belief that medication is necessary. *** higher values indicate stronger fears about medication. *** higher values indicate higher adherence

Tailored interventions to implement recommendations for elderly patients with depression in primary care: a pragmatic cluster randomised controlled trial (Norway)

The Norwegian trial targeted elderly patients with depression. Depression in elderly patients is abundant, the prevalence increases with increasing age and the risk of a chronic course is higher among elderly patients as compared with younger adults.

The Norwegian research team conducted a systematic review on clinical practice guidelines for the management of depression in adults. Following a prioritisation process in collaboration with a reference group consisting of representatives from relevant stakeholder groups in Norway the researchers prioritised six recommendations to be implemented in the intervention municipalities. Table 6 shows that one of the five key outcomes improved significantly: the proportion of recommendations adhered to for recurrent depression and dysthemia.

Table 6. Indicators used for the primary outcome (Norway; n=307)

Outcomes	Nr. of measurements	Mean (SD) T1 intervention group	Mean (SD) T1 control group	No of patients (Intervention/Control)	p
Average adherence to recommendations for each practitioner	1-7	0.52 (0.42)	0.46 (0.41)	307 (141/166)	0.204
Proportion of recommendations adhered to for mild depression	7	0.52 (0.22)	0.54 (0.20)	50 (18/32)	0.790
Proportion of recommendations adhered to for moderate depression	7	0.51 (0.22)	0.44 (0.23)	37 (18/19)	0.334
Proportion of recommendations adhered to for severe depression with or without psychosis	2	0.38 (0.27)	0.55 (0.42)	52 (21/31)	0.110
Proportion of recommendations adhered to for recurrent depression and dysthymia	1	0.56 (0.50)	0.40 (0.49)	166 (84/86)	0.043

Tailored implementation of cardiovascular risk management in general practice: a cluster randomized trial (Netherlands)

The aim of the present study was to determine the effectiveness of a tailored implementation program on practice and outcomes in cardiovascular prevention compared to usual care in general

practice. The primary outcome referred to the professional performance of practice nurses (PNs) and reflected adoption of recommendations for personalised counselling and education of CVRM patients. We considered PNs' professional performance to be adequate when at least one of the following two conditions was met:

1) There is a record in the patient's record, or other healthcare provider-based record, that the patient has received advice on at least one lifestyle item as specified in prevailing guidelines of CVRM; diet, smoking or physical exercise. Also, at least one target for improving an aspect of lifestyle is recorded. This target is maximized 15 months previously. When a patient has a perfect lifestyle, then that will be recorded.
2) There is a notation in the patient's record that the patient has none, mild or major depressive symptoms and that the patient has been referred to E-health, a physical exercise group or depression treatment respectively.

Table 7 showed that the overall proportion of patients with recorded life style counselling or referral was low, with little difference between study groups (11 versus 12%).

Table 7. Primary and secondary outcomes (Netherlands; n=1782)

	Control arm (n=787 patients)	**Intervention arm (n=995 patients)**
Number of patients who received recommended counselling or referral *(=primary outcome measure, group 1-2-3 combined)*	86 (10.9%)	116 (11.7%)
Depression screener or other method used, different from clinical judgement	1	15
Record of depressive symptoms		
Non	2	21
Moderate	4	2
Severe	1	0
Total	7	23
Group 1 (non-depressed patients)		
Recorded life-style advice	139 (17.6%)	118 (11.9%)
-with individual goal on stop smoking	13 (1.7%)	15 (1.5%)
-with individual goal on diet	41 (5.2%)	78 (7.8%)
-with individual goal on physical exercise	33 (4.2%)	74 (7.3%)
-with individual goal for weight reduction	18 (2.3%)	32 (3.2%)
Any individual goal recorded	83 (10.5%)	112 (11.3%)
Group 2 (patients with depressive symptoms)		
Referral to physical exercise group	1	2
Already in physical exercise group	0	0
Group 3 (patients with major depression)		
Referral for depression treatment	2	2
Previously referred for depression treatment	1	2

A cluster randomised trial of tailored interventions to improve management of overweight and obesity in primary care (UK)

The primary aim of the study was to examine the effectiveness of a tailored implementation strategy in comparison with usual care for improving adherence to the NICE guidelines for the management of overweight and obesity in primary care teams. The primary outcome of this study was the

proportion of overweight or obese patients to whom the health professional had offered a weight loss intervention within the study period Table 8 shows the results of the mean summary outcome at baseline and follow-up.

Table 8. Mean of the primary outcome of the UK trial (n=47807)

GP Practices	Summary outcome at Baseline (%)	Summary outcome at follow-up (%)
Control	-	13.2 SD: 5.91 (N=32,079)
Intervention	-	15.1 SD: 10.82 (N=17,728)

Table 9. Means and standard deviations of secondary patient outcomes (UK)

	Baseline		Follow-up		Between baseline and follow-up*	
	Control	Intervention	Control	Intervention	Control	Intervention
The proportion of patients with a BMI and/or waist circumference measurement recorded within the study period	29.1 SD: 6.56 (N=32,079)	28.8 SD: 4.36 (N=17,728)	53.0 SD: 9.24 (N=32,079)	51.4 SD: 7.42 (N=17,728)	NA	NA
The proportion of patients with a record of lifestyle assessment	-	-	23.1 SD: 7.61 (N=32,079)	23.9 SD: 6.05 (N=17,728)	NA	NA
Referral to external weight loss services	-	-	5.1 3.36 (N=32,079)	3.7 3.36 (N=17,728)	NA	NA
The percentage of overweight/obese patients who lost weight (at least 1 kg) during the study period	37.6 SD: 3.57 (N=28,412)	41.0 SD: 4.07 (N=18,468)	38.0 SD: 5.79 (N=19,264)	39.6 SD: 8.11 (N=11,868)	42.2 SD: 4.06 (N=39,076)	41.7 SD: 4.14 (N=23,136)
The mean weight change over the study period	-0.13kg SD: 0.46 (N=28,412)	-0.28kg SD: 0.37 (N=18,468)	-0.29kg SD: 0.78 (N=19,264)	-0.21kg SD: 0.68 (N=11,868)	0.09kg SD: 0.59 (N=39,076)	0.04kg SD: 0.53 (N=23,136)

Evaluation of a tailored implementation strategy to improve the management of patients with chronic obstructive pulmonary disease in primary care: a cluster randomized trial (Poland)

The objective of this study was to examine the effectiveness of a tailored implementation intervention to enhance physicians' adherence to four recommendations for the management of COPD patients in primary care. The primary outcome was the GPs' adherence to the recommendations, which was dichotomized as follows: A positive score was given if all four recommendations were followed, while following less than four recommendations was given a negative score.

Questionnaires were send to 1029 patients from which 476 (46,26%) were in intervention group and 553 (53,74%) in control group. Medical records were reviewed of 907 patients who consulted their GP during a study period for COPD (490 females and 400 males, 17 with missing data about age and sex). Mean age of all patients was 68,67 years (females 67,59 - for 3 females data about age are missing, males 70,02). Total number of visits during study period was 6851 in which 3077 because of

COPD. We found a remarkable difference between intervention and control group in the use of clinical interventions (768 in intervention group and only 59 in control group). Data showed that most often reported interventions in the intervention group were dyspnoea evaluation and checklist based informing, while in the control group most often were brief anti-smoking counselling and dyspnoea scoring. Our study is probably the first randomized trial of a tailored implementation program for improving primary care for patients with chronic illness in the Central Eastern European country.

Results of surveys for process evaluation across five trials

In order to compare and operationalize the results of the surveys in the four countries, we defined a determinant to be confirmed if the sum of the HCP, who answered the associated questionnaire items with "yes" or "partly", was > 50%. Accordingly, a determinant was considered to be successfully modified if > 50% of the HCP answered the associated items with "yes" or "partly". Table 10 shows a comparison between the four trials concerning the number of confirmed and modified determinants. Following this definition, 80 – 100% of the determinants were perceived as relevant and as modified by the interventions by the target groups.

Table 10. Number of determinants perceived as relevant and modified per country

Number of determinants	GE	UK	NL	PL	ALL
… intended to be addressed by the implementation intervention	n=9	n=7	n=20	n=15	51
… confirmed as relevant by the HCP *	88,8% (n=8)	85,7% (n=6)	95% (n=19)	100% (n=15)	94,1% (n=48)
… perceived as modified by the implementation intervention **	100% (n=9)	100% (n=7)	80% (n=16)	100% (n=15)	92,2 % (n=47)

* Defined as number of determinants which were considered as relevant or partly relevant by > 50% of the HCP. ** Defined as number of determinants which were perceived as modified or partly modified by > 50% of the HCP

Results of qualitative process evaluation

Table 11 shows the descriptive analysis of the number of identified determinants and strategies per country and overall. In total 95 determinants have been identified after the implementation intervention was applied. About 70% of these determinants were already identified previously in WP2, but merely 30% of them have been prioritized. Overall 67 "better strategies" were found. Of these, 43% were already identified in WP2, but only 15% were prioritized.

Table 11. Descriptive analyses of the interviews for qualitative process evaluation

	GE	NL	UK	NW	PL	ALL
Number of determinants identified during the qualitative process evaluation	**33**	**26**	**21**	**7**	**8**	**95**
Thereof identified in WP2	75,7 % (n=25)	53,8 (n=14)	85,7% (n=18)	42,9% (n=3)	75,0% (n=6)	69,47% (n=66)
Thereof prioritized in WP2	63,6% (n=21)	0	9,5% (n=2)	42,9% (n=3)	37,5% (n=3)	30,5% (n=29)
Number of strategies identified during the qualitative process evaluation	**15**	**22**	**4**	**12**	**14**	**67**
Thereof identified in WP3	66,6% (n=10)	9,0% (n=2)	50% (n=2)	33,3% (n=4)	78,6% (n=11)	43,3 (n=29)

Thereof prioritized in WP3	9,0% (n=3)	9,0% (n=2)	0	0	35,7% (n=5)	14,9% (n=10)

Summary

Data collection for all five trials has been conducted. The descriptive results indicate that one intervention effectively increased adherence to recommendations (German trial), while three interventions had no or little impact on the primary outcome (Norwegian, Dutch and UK trial).

For the process evaluation, data from 93 health care professionals was analysed. The survey on practice characteristics showed variance regarding the practice structure and working conditions between the five trials, which should be considered as possible determinant for implementation for further analyses. The survey on implementation activities showed mixed (on average moderate) fidelity to the implementation interventions, which might be connected to the lack of effectiveness. The descriptive results on the survey on determinants indicated, that the logic models of the trials have largely been confirmed and thus, that the methods used for tailoring are valid. This seems to conflict with the fact that the majority of interventions had no or little impact on implementation. This discrepancy might be explained by the finding of the qualitative process evaluation, which showed that the approach for identifying determinants and strategies was effective, while methods for prioritization and selection should be improved.

3. Potential impact, main dissemination activities and exploitation of results

Relevance of the TICD project

Much of the worldwide investment in biomedical and health research is wasted because of challenges to knowledge implementation that remain understudied and unaddressed. Consistent evidence shows that health systems globally fail to optimally use evidence with resulting inefficiencies, reduced quantity and quality of life for citizens and lost productivity. With ageing populations and increasingly effective healthcare technologies, healthcare for individuals with chronic diseases comprises a major area of knowledge implementation in healthcare. Improving chronic illness care will result in more quantity and quality of life, less disability and higher productivity (many chronically ill patients are not yet retired).

Scientific impact of the TICD project

The growing emphasis on implementation science has led to the establishment of an interdisciplinary field of implementation research (also known as knowledge translation research) in the previous decade. Implementation research has increasingly focused on what factors are associated with successful uptake of knowledge in routine healthcare delivery. Multiple factors determine knowledge implementation by different stakeholder groups. While tailored implementation is (under various labels) widely accepted, little is known about the validity and effectiveness of different tailoring methods. The TICD project has opened a new field of comparative research concerning the usefulness of such methods in the context of improving organization, delivery and outcomes of healthcare. In particular, it has contributed in the following ways:

- *Better documentation of tailored methods and models*. Given the focus on tailoring methods and models throughout the TICD project, we provided a range of examples of documentation of these methods in scientific papers.

- *Validation of measurement methods used for tailoring*. Process evaluation in the trials of tailored implementation programs confirmed the results of interviews with stakeholders, in which determinants of practice were identified. They also identified a number of factors that had not been identified previously.
- *Better use of theory*: the TICD framework (with 57 concepts in 7 domains) was based on systematic analysis of existing theory, frameworks and models and tested in the TICD project. This is available for future applications.
- *Insight into timing of tailoring*. The TICD project used tailoring at the design stage of implementation programs, and found that the uptake of these interventions was mixed. This suggests a "self-tailoring" process in the use of the implementation programs.
- *Stakeholder involvement*. Tailoring involved health professionals and other stakeholders in the design of interventions, thus illustrating the relevance of the TICD project for stakeholder involvement in interventions and research generally.
- *Implementation of evidence-based chronic care*: Relevant aspects of healthcare were improved in patients with chronic diseases in five countries, although the pre-defined primary outcomes of the trials were not influenced.

Improving chronic illness care

The chronic conditions targeted in the TICD project are characterized by high prevalence in the population, major disease burden and high costs for both individual patients and for society. Ageing populations, improved life styles and more effective health technologies have all contributed to the increasing numbers of patients with chronic diseases in Europe. Chronic diseases are not equally spread over the populations, but affect low educated and poor individuals more frequently. Given the gaps in the provision of healthcare to patients with chronic conditions, there is an urgent need for better understanding of implementation processes in chronic illness care in order to improve the uptake of knowledge in routine healthcare delivery and thus to improve its outcomes. While each chronic disease and each healthcare system has unique characteristics, there are a number of characteristics that are shared across chronic conditions and healthcare systems:

- Most chronically ill patients receive most of their healthcare in ambulatory and primary care settings. In many European countries, self-employed health professionals, who are based in relatively small organizations, provide this. In addition, patients may attend hospital for specific diagnostic tests, specialized treatment, or emergency care.
- Evidence-based clinical practice guidelines are available for many chronic diseases. They provide recommendations on safe and effective diagnosis, treatment, counseling, and monitoring. The guidelines need to be updated regularly in order to keep up with the developing clinical evidence. Health professionals face the challenge to implement these continuously developing clinical guidelines in their professional behavior.
- Health care increasingly needs to address the management of individuals with multiple coexisting diseases. Adhering to present clinical practice guidelines for single diseases may have adverse effects in the care of patients with multimorbidity.
- A patient's experience of chronic disease is not static and so health care systems need to be flexible enough to change care in response to patients' changing needs. For instance, the emphasis is on self-management and screening in early stages of a disease, monitoring and secondary prevention in established disease, tertiary prevention and palliative care in end stages of a disease.

- Chronic illness care has to be provided over a long period of time and it usually involves a team of health professionals. This poses challenges for the coordination and continuity of care.

Added value of European collaboration

The capacity and competiveness of implementation research in Europe needs to be improved. Canada provides a good example of a comprehensive and integrated strategy to building up a workforce and infrastructure for implementation research. The TICD project has brought together internationally leading interdisciplinary research teams in partnership with hospitals and community agencies to address the fundamental challenges of this new field. While each group is focusing on an important element of implementation research, no group has the critical mass or full interdisciplinary mix to fully address the complex research agenda across all decision maker groups and levels of health care systems. We argue that we will only make substantial progress in this field if we can encourage the cross fertilization of ideas across different research teams targeting different decision making groups and adopting different approaches to develop implementation theory and practice.

Societal impact

The goal of the TICD project was to ensure that the investment in research and clinical care in Europe is fully realized through implementation of best practices and application of new knowledge to yield beneficial outcomes for society. Our research has generated findings of interest to clinical, policy and health care researchers and those charged with knowledge implementation in European health care systems. Wherever we could, we have facilitated an integrated knowledge implementation and commercialization strategy for getting practical guidelines into the hands of the appropriate users.

4. Public website address and contact details

This is the public website on the TICD project: http://www.ticd.umed.lodz.pl/

Email information of the project coordinator: Michel.Wensing@Radboudumc.nl