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Interdisciplinary, internet-based trans health care (i²TransHealth): study protocol for a randomised controlled trial

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ABSTRACT

Introduction Living in an area with no or deficient structures for trans health care is disadvantageous for trans people. By providing an internet-based health care programme, i²TransHealth aims at reducing structural disadvantages for trans people living in areas lacking specialised care. The e-health intervention consists of video consultations and a 1:1 chat with a study therapist. Additionally, the i²TransHealth network cooperates with physicians, who especially offer crisis intervention close to the participants' place of residence. The aim of this study is to evaluate the (cost-)effectiveness of the internet-based health care programme for trans people compared with a control (waiting) group. The following research questions will be examined with a sample of 163 trans people: Does a 4-month treatment with the i²TransHealth internet-based health care programme improve patient-reported health-outcomes? Is i²TransHealth cost-effective compared with standard care from a societal or health care payers' perspective? Does the participation in and support by i²TransHealth lead to an increase of trans-related expertise in the physician network?

Methods and analysis In a randomised controlled trial, the outcomes of an internet-based health care programme for trans people will be investigated. In the intervention group, participants are invited to use i²TransHealth for 4 months. Participants allocated to the control group will be able to start with their transition-related care after 4 months of study participation. The primary outcome measure is defined as the reduction of psychosomatic symptoms, as assessed by the Brief Symptom Inventory-18, 4 months after using the i²TransHealth programme. Participants in both groups will undergo an assessment at baseline and 4 months after using i²TransHealth.

Ethics and dissemination Positive ethical approval was obtained from the Hamburg Medical Association (PV7131). The results will be disseminated to service users and their families via media, to health care professionals via professional training and meetings and to researchers via conferences and publications.

Trial registration number NCT04290286.

Protocol version 22 December 2021 (V.1.0)

Strengths and limitations of this study

- Installation of an innovative model project in which an internet-based health care programme i²TransHealth for trans people will be tested by means of a randomised controlled trial.
- i²TransHealth is provided by mental health professionals of a gender clinic and a network of trained primary care physicians and psychiatrists.
- In the intervention group, trans people receive 4 months of the i²TransHealth programme that includes video consultations every 14 days and local crisis interventions if needed.
- The study is designed to evaluate the effects of the i²TransHealth programme on symptom burden, quality of life, treatment satisfaction, health costs and cost-effectiveness compared with a control (waiting) group.
- The process evaluation examines the feasibility, effectiveness and acceptance of i²TransHealth and the prerequisites for the continuation of the project.

BACKGROUND AND RATIONALE

Trans people (short for, eg, transgender, gender-diverse, genderqueer or non-binary) reference the term 'trans' to indicate that their gender identity and expression does not correspond to their sex assigned at birth.[1] The short form trans can include both binary trans people who identify as women or men and non-binary trans people who identify neither (exclusively) as male nor as female (eg, gender-diverse, agender, gender-fluid). Further, in the context of medical treatment, health care professionals (HCPs) use the clinical diagnosis gender incongruence (GIC; according to ICD-11) or gender dysphoria (GD; according to DSM-5) to provide health services to trans people.

Internationally[2 3] as well as in Germany,[4] the aim of medical care that focuses on rare clinical conditions is to provide specialised,

professionally coordinated and interdisciplinary care. This is also relevant for the treatment of GIC/GD. Health care in which psychiatry and psychotherapy, endocrinology, surgery (gynaecology, urology, plastic surgery) and other areas (including dermatology, phoniatrics) cooperate in an interdisciplinary setting is considered evidence-based.[5] Many trans people require a variety of different and individually tailored diagnostic and therapeutic measures. The aim of trans health care is to enable trans people to lead a self-determined life in their gender, to reduce the burden of symptoms of GIC/GD and to improve the quality of life.[6] GIC/GD is rather rare, although prevalence rates vary according to definition, sample type and time of survey.[7] Trans people with GIC/GD are an extremely heterogeneous group of people: not every person with GIC/GD wishes to receive gender-affirming medical interventions (GAMI), for example, hair removal treatment, hormone therapy, mastectomy and breast augmentation, genital, facial, and laryngeal surgeries[8]; and the specific care needs of those seeking treatment differ.[9–11]

The combination of relatively low prevalence and extremely high demand for interdisciplinary treatment leads to a specific problem of care. Currently, in Germany—as in other European countries[12]—there is only one clinical institution that offers the transition-related services in a coordinated and integrated manner: the Interdisciplinary Transgender Health Care Centre Hamburg (ITHCCH), founded in 2013 at the University Medical Centre Hamburg-Eppendorf (UKE). Apparently, the lower prevalence compared with for example, back pain makes it difficult to establish a larger number of specialised centres. However, the provision of gender-affirming care on a broad scale remains a challenge: people outside of larger cities such as Hamburg, Germany, do not sufficiently benefit from integrated care[10] and are structurally disadvantaged by the lack of medical and mental health professionals with transition-related expertise.[13]

Limited access to the general health care system, which is supposed to treat all people with the same attention and respect, is considered a risk factor for health disparities.[14 15] This is particularly true in the context of health problems, because of which people are still stigmatised, as is the case with mental disorders[16] and GIC/GD,[17] making it hard for trans people finding supportive treatment. Relevant studies from the USA confirmed the disadvantages associated with the lack of HCPs being informed about trans health care.[18 19] For example, trans people avoid offers and assistance from the health care system due to experienced or expected discrimination, even if they need acute treatment,[13 20] and even in times of the COVID-19 pandemic, for example, testing for SARS-CoV-2.[21]

Researchers have already indicated the use of e-health approaches for trans people living in rural villages and small towns.[22 23] Specifically, it is hypothesised that e-health approaches can help trans people with increased mental stress living in rural areas to receive support from mental and physical health services.[24] Based on our clinical experience and previous research[10 24 25] we expect e-health services offered by trans-informed HCPs supporting both less-specialised HCPs and trans individuals living outside a metropolis may be helpful in reducing trans people's reservations about rural HCPs.[26 27] For Germany, both quantitative survey research and qualitative studies revealed minority stress and health disparities for trans people.[28–30] Possible consequences of structural discrimination are listed in box 1.

Box 1 Consequences of structural discrimination of trans people

- Lack of access to specialised care, resulting in incorrect treatment, care refusal or avoidance[13 64]
- Admission to insufficiently specialised, decentralised care, high treatment dissatisfaction[20 27 29]
- Increased mental stress, favoured development of mental disorders like depression or anxiety[23 63 65]
- Insufficient medication and/or inpatient psychiatric treatment, increased occupational absenteeism[28]
- Acceptance of long, cost-intensive travel routes to the metropolis, with loss of working hours[13 66]

Objectives

The overall objective of i²TransHealth is to improve transition-related care for trans people through an e-health approach. In addition, we have trained a network of primary care physicians and psychiatrists on trans-related issues so that they can complement our e-health approach and provide medical assistance to participants in their area as needed (eg, in the event of a crisis). By bringing integrated services of a specialised university medicine to smaller towns and rural regions, we expect our approach to result in reduced symptom burden, increased quality of life and increased treatment satisfaction.

The evaluation concept of i²TransHealth is based on three modules: (1) Statistical evaluation of the effectiveness of the i²TransHealth programme with regard to symptom burden of trans people within the framework of a randomised controlled trial (RCT; intervention vs control group); (2) Health economic cost-effectiveness analysis; (3) Quantitative-qualitative process evaluation. The trial corresponds to the Standard Protocol Items: Recommendations for Interventional Trials statement for reporting parallel group randomised trials.[31] In addition to the RCT, the cost-effectiveness of i²TransHealth and the increase in knowledge of the cooperating physicians will be analysed. The evaluation is based on scientific standards (randomisation, control group design) and the demand to meet both the needs of the treatment-seeking trans people and the cooperating HCPs.

Trial design and conceptual framework: i²TransHealth model

i²TransHealth is the acronym for interdisciplinary, internet-based (i²) trans health care. It is designed for

trans people seeking health care, especially those being in an early phase of transition or exploring their gender identity. Our approach is interdisciplinary for two reasons. First, we consider the combination between specialised study therapists on the one hand and primary or psychiatric care providers on the other to be interdisciplinary. Second, our approach allows participants both access to and reimbursement for GAMI when indicated.[32] We refer to our model as internet-based because the core element of our intervention, biweekly video sessions with study therapists, is delivered through an e-health platform. The evaluation is funded by the Innovation Funds of the Joint Federal Committee (G-BA), Germany (funding code: 01NVF17051). The technical and content-related development of the i²TransHealth e-health platform was finalised before the study began. The i²TransHealth internet-based health care programme was implemented by the Institute for Sex Research, Sexual Medicine and Forensic Psychiatry (The institute's own unit for forensic psychiatry is without relevance for the care of trans people. For reasons of readability, we only mention 'Institute for Sex Research' throughout the paper) in cooperation with the consortium partners AVONIS, an agency for new media and Haedel Computerhardware. Both provide concept and design of the website and technical support during the duration of i²TransHealth. The subsequent research of i²TransHealth is supervised by three independent institutes for (1) Sex Research, (2) Health Economics and Health Services Research and (3) Medical Biometry and Epidemiology, UKE.

Sharing expertise by the Interdisciplinary Transgender Health Care Centre Hamburg

Core structure of i²TransHealth is the Interdisciplinary Transgender Health Care Centre Hamburg (ITHCCH), a multi-professional and cross-sectoral health care centre for trans people.[33] The health care system in Germany is divided into three sectors: outpatient care, hospital care and rehabilitation facilities (both outpatient and inpatient). For the reasons described above, the ITHCCH has so far been unable to offer its specialised services adequately to people living outside the metropolitan region. As a new form of care, i²TransHealth aims at catching up with the care by ITHCCH for rural residing trans people. Thus, i²TransHealth shall also provide access to various GAMI of the ITHCCH. Since medical transition usually lasts longer than the i²TransHealth intervention time (4 months from T_0 to T_1), we assume that participants are often referred for GAMI after finishing their intervention time.

Improvement of the area-wide trans health care

We implemented i²TransHealth through both our e-health intervention and the network of office-based physicians in Northern Germany. The combination of physicians near to the trans persons' place of residence and a location-independent e-health intervention including video consultation changes the structure of care without giving up the expertise of ITHCCH. With i²TransHealth, trans people should be able to take advantage of the transition-related health services provided by the ITHCCH, even if they live in rural regions with no or deficient trans health care structures. In the long term, decentralised access to i²TransHealth is expected to ease pressure on the specialised trans health care system from those seeking treatment. Additionally, through contact with trans persons, the network physicians should be able to reduce potential prejudices against trans people as well as the tendency to generalise, which contradicts the heterogeneity of this group.[34 35]

Installation of the model project i²TransHealth

The i²TransHealth internet-based health care programme is implemented through three modules.

Module 1: Setup and training of the i²TransHealth physicians' network

The network consists of 12 HCPs, 6 tandems of physicians for (1) primary care and (2) psychiatry. In order to set up this network, we were looking for physicians who were open to and interested in the topic of transgender health care, but who were not experts in the field. The network consists of 12 physicians who cooperate with the project by offering psychiatric and general health care. The physicians have signed a cooperation agreement that includes informed consent as well as regulates project-related tasks and the confidential handling of the information obtained in the project. Regarding participant recruitment, collaborating physicians are not involved in informed consent processes.

At the beginning of the i²TransHealth recruiting, the physicians were trained during a 2-day kick-off event, instructed in the use of the e-health platform (cf. module 2) and sensitised for the clinical interaction with trans persons. The physicians were also trained about the scope of services of the platform and its role during the study period. Personal with and between HCPs should also help to maintain cooperation between physicians during the study period. They have their own e-health area with trans-related information as well as the possibility to contact the specialists at ITHCCH via an easy-to-use messaging function. That way, the cooperating physicians have the possibility of supervision through the course of study (regular round table and contact in between). In the event of a crisis, study participants can always turn to a cooperating physician who, unlike uneducated HCPs, do not reject them for lack of expertise and refuses treatment if trans people reveal their transition.[18]

Module 2: Development and operation of an e-health platform

The e-health platform (see www.i2transhealth.de) is available to study participants as a tool for the following tasks: (1) General information portal for people seeking transition-related care, which not only provides information on the mental and somatic aspects of GIC/GD, but also contact details of the cooperating physicians; (2)

Platform for video consultation; (3) easy-to-use contact with the ITHCCH for participants: participants can use the e-health portal to ask questions to the study therapist at short notice beyond the 14-day consultation hours.

The e-health platform is also designed as an instrument for the cooperating physicians for the following tasks: (1) internal area for physicians' network: Members of the physicians' network also receive specific information on GIC/GD via an internal area; (2) contact with the ITHCCH for the physicians: the physicians can ask questions to colleagues of the ITHCCH at any time via the e-health portal; (3) online round table: Every 2 months the cooperating physicians have the possibility to exchange information via a round table online videoconference.

Module 3: Flanking media activities

For the success of the project, it is crucial that trans people seeking GAMI in regions with weak trans health care provision are informed about i²TransHealth. In addition to the e-health platform mentioned above, we organise media marketing for this purpose. Media measures to publicise the project will be prepared and carried out continuously during the study period.

METHODS AND ANALYSIS

Study design

The study is an RCT comparing the effectiveness of the i²TransHealth intervention and control group with allocation ratio of 1:1 in a sample of trans people seeking health care. Participants in the control (waiting) group will have access to transition-related care 4 months after randomisation. All study participants will be assessed at baseline (T_0) and 4 months after baseline (T_1).

Study setting

Recruitment will run from May 2020 to December 2021 in Northern Germany. The RCT is conducted by three independent research institutes, all located at the UKE: The Institute for Sex Research, the Institute of Health Economics and Health Services Research and the Institute of Medical Biometry and Epidemiology. Whereas scientists from Medical Biometry are responsible for the data analysis according to a statistical analysis plan, researchers of the Institute for Sex Research are responsible for data monitoring. An Advisory Board is established. The members of the Advisory Board are independent of the project management and the evaluators. The Advisory Board advises the project management on the implementation of the study and helps with decisions on the further progress of the study.

The initial contact of potential participants with our study can take place on two ways: Either the potential study participants contact the outpatient unit directly (by phone or via www.i2transhealth.de) or via the physicians' network. After information about i²TransHealth, interested participants receive an appointment for an initial face-to-face interview (see figure 1). With this interview, we aim to facilitate the development of a therapeutic relationship and to assess, among others, suicidal tendencies.

Inclusion criteria

The target group of i²TransHealth are persons who (1) receive a diagnosis of either GIC or GD based on the

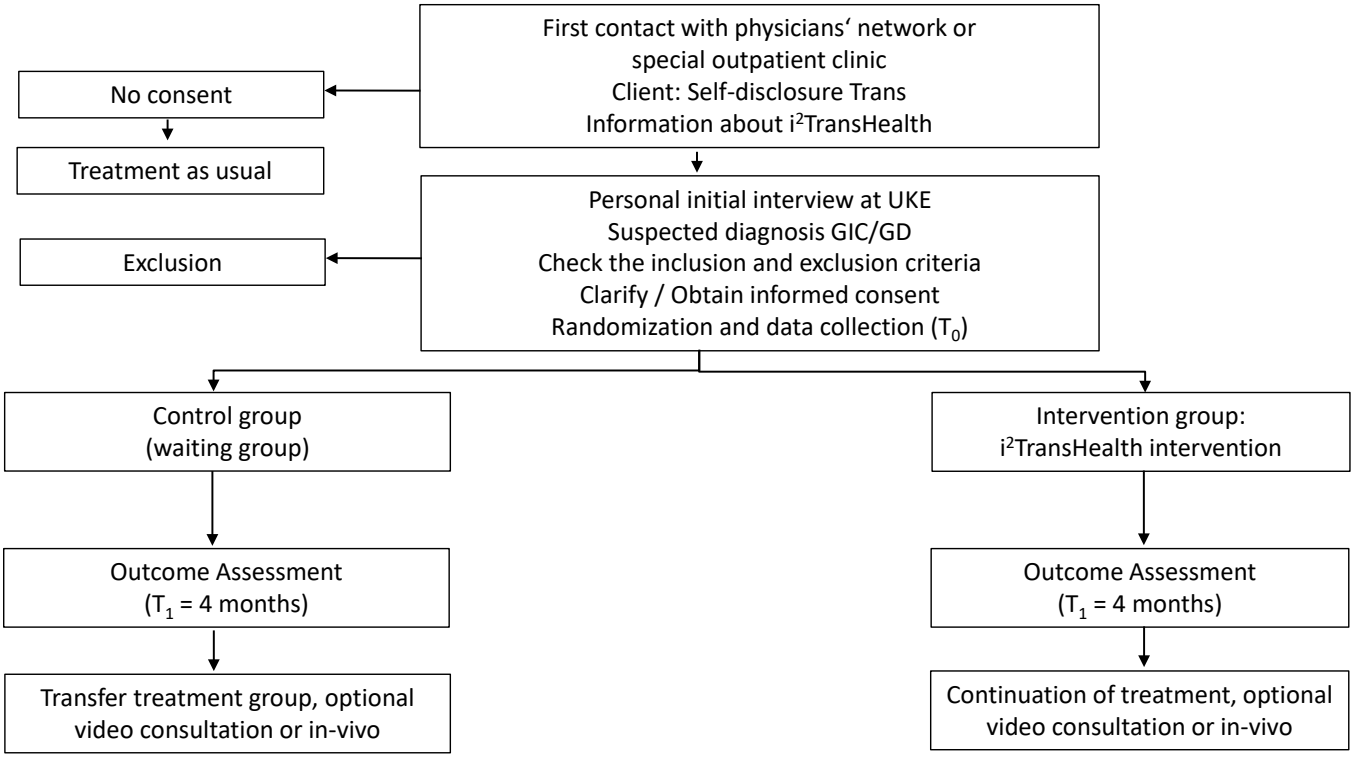

Figure 1 Flow chart of the RCT. GD: gender dysphoria; GIC: gender incongruence; RCT: randomised controlled trial.

initial face-to-face interview, (2) are 18 years or older, (3) live at least 50 km outside Hamburg, (4) introduce themselves to one of the cooperating physicians in the i²TransHealth network or directly in the study centre, (5) are cognitively, verbally and auditorily able to use the video consultation and (6) have not already started transition-related treatments elsewhere.

Exclusion criteria

Individuals will be excluded from the study if they have an indication for inpatient psychiatry treatment, for example, due to acute psychotic symptoms screened with Prodromal Questionnaire - brief version (PQ-B)[36] or severe depressive symptoms screened with Beck Depression Inventory - revision (BDI-II),[37] if they report being suicidal screened with Columbia-Suicide Severity Rating Scale (C-SSRS),[38] if they were tested with an IQ below 70, if they show acute addictive drug intoxication, if they do not meet technical requirements (eg, no internet access, lack of IT-related knowledge) or if they have insufficient knowledge of German or English language. If we need to exclude people, we will try to find suitable treatment elsewhere. The number of those being non-eligible and the reasons for exclusion are documented. Included participants will be compared with all other contacted and screened participants with respect to predefined screening parameters to describe potential sample selection.

Interventions

During the initial face-to-face interview, the study therapists provide a study clarification and examine the inclusion criteria. If the participant fits the criteria, the admission to the e-health platform follows the informed consent and randomisation, either to the intervention or to the control group. Study participants answer a set of questionnaires (see box 2) before randomisation (T_0) and right after the intervention phase of 4 months (T_1).

Box 2 Set of questionnaires

Primary outcome

- Symptom burden: Brief Symptom Inventory-18 (BSI-18)[39]

Secondary outcomes

- Quality of life: World Health Organization Quality of Life Assessment, abbreviated version (WHOQOL-BREF) [48]
- Treatment satisfaction: [german] Zufriedenheit mit der stationären Versorgung (ZUF-8, modified version): [50]
- Cost-effectiveness analysis: Client Socio-demographic and Service Receipt Inventory – European version (CSSRI[51 55]) and European Quality of Life 5 Dimensions 5 Level Version (EQ-5D-5L[49])

Further questionnaires

- Personal and demographic information (eg, self-described sexual identity and gender identity, current or past romantic relationships, experiences with trans community, identification as part of a multiply discriminated group such as person of colour, desired GAMI, mental or physical health issues)
- Impact of the events related to the COVID-19 pandemic on individuals (questions taken from an international survey[21])

i²TransHealth treatment (intervention group)

Trans people randomised to the intervention group receive 4 months of e-health intervention according to the i²TransHealth internet-based health care programme.

The clinical interventions take place every 14 days via video consultation. In addition to a stable internet connection for the video consultation, study participants need an online device with camera, microphone and earphones or loudspeaker. The technical connection is provided by the video service provider Cisco WebEx, which fulfils the security requirements of data protection law. In order to test the effectiveness of i²TransHealth, study participants must attend at least half of the scheduled video sessions (≥4 sessions). If a participant fails to attend more than three video sessions, this is considered a protocol violation and the study team terminates the intervention. Additionally, the study team considers a protocol violation if a participant begins other transition-related interventions (eg, hormone treatment) without it being indicated by the study therapist. In both situations, the participants in question are included in the analysis of the intention-to-treat population (ITT).

In addition to the video consultation hours, the study participants of the intervention group are connected to the study therapists via messaging in the e-health platform. Their assigned study therapist answers their messages within 48 hours on weekdays. The message function is not intended as a means of emergency contact. In case of emergency, participants need to call either the emergency line or the physician from the i²TransHealth network, whose practice is closest to the participant. A completion of the intervention phase does not result in the end of the transition-related care.

Control group (waiting group)

Study participants in the control group wait 4 months until they are offered an online intervention according to the i²TransHealth internet-based health care programme or a transition to regular care. The period of 4 months is comparable to the usual waiting time for an appointment in the regular outpatient clinic for patients outside of the metropolitan area. By offering treatment to all study participants, we aim to ensure that access to gender-affirming treatment is available also to those who live far from a clinic specialised in trans health care.

Hypotheses and outcomes

Primary outcomes

We hypothesise that, 4 months of treatment with i²TransHealth compared with the waiting group will lead to an improvement in symptom burden according to Brief Symptom Inventory (BSI-18).[39] To our knowledge, there has been no validation for the short version of the BSI-18 in an RCT with trans people. Nevertheless, the BSI-18 was selected as the questionnaire for the primary

outcome of i²TransHealth (see box 2) because it is a widely used screening tool for the clinical relevance of distress.[40 41] Furthermore, BSI-18 has already been used with LGBTQIA+ populations (ie, lesbian, gay, bisexual, transgender, queer, intersex and asexual people; the + stands for the inclusive representation of all identities and expressions).[42 43] Finally, four methodologically similar RCTs using the BSI-18 found medium to large effects in internet-based interventions for individuals with panic and phobias, complicated grief and post-traumatic stress disorder.[44–47]

Secondary outcomes

We hypothesise that 4 months of treatment with i²TransHealth compared with the waiting group leads to an improvement in (health-related) quality of life according to World Health Organization Quality of Life Assessment, abbreviated version (WHOQOL-BREF)[48] and European Quality of Life 5 Dimensions 5 Level Version (EQ-5D-5L)[49] and treatment satisfaction according to a modified version of ZUF-8.[50] Additionally, we expect differences of i²TransHealth over the waiting group in terms of increased direct costs and reduced lost productivity according to a modified version of Client Socio-demographic and Service Receipt Inventory – European version (CSSRI).[51] Further positive effects are expected in an increased knowledge of the cooperating physicians with regard to trust in clinical practice with trans persons according to an instrument for comparative self-assessment (Vergleichende Selbsteinschätzung: VSE)[52] and in satisfaction with support via the i²TransHealth network according to a modified version of ZUF-8.[50] The data collected from the physicians refer to secondary outcomes only, and they have given informed consent for data collection. The physicians are not involved in the data collection from the service users.

Changes to trial outcomes after trial commenced

None

Sample size

We aim for a sample size that permits the detection of a standardised mean difference of 0.47 between intervention and control group for the primary outcome (change in the BSI-18 cumulative score from baseline to 4 months) with a statistical power of 0.80 at a type I error rate of 0.05 (two sided). These assumptions result in a necessary sample size of 147 participants. To account for the initially presumed drop-out rate of 30%, 210 participants were to be included. Due to pandemic-related delays, a term extension was requested, in the course of which the case number was adjusted to the observed drop-out rate of 10%. This reduces the number of participants to be included to 163.

Assignment of interventions

Double-blind study (Investigator, Outcomes Assessor): Persons who evaluate the results remain blind to the condition of the participants (intervention or control group). After the study participants are included into the i²TransHealth study, they receive online access to the e-health platform. First, they are asked to answer questionnaires for baseline assessment (T_0). Only after completion of T_0 assessment, a 1:1 randomisation for intervention and control group is carried out using a computer-based code with variable block length generated by the Institute for Medical Biometry and Epidemiology (figure 1). At the end of study participation after 4 months, participants complete the T_1 assessment. Against this background, we do not expect any loss of data.

Patient and public involvement

As an RCT, i²TransHealth builds on participatory health care research that has investigated trans people's needs and concerns regarding interdisciplinary trans health care.[10] Both the research question and the objectives of the RCT have been derived from this study. As support groups report on our project to their members, cooperation with these groups is important for recruiting. Fortunately, we received positive feedback on our approach so far. We intend to share our findings with trans groups and service users through the media once the study is complete.

Data collection, management and analysis

Survey data will be collected before the intervention (T_0) and after 4 months of study participation (T_1) in a survey module of the e-health platform. The following instruments are used: BSI-18, WHOQOL-BREF, ZUF-8, CSSRI, EQ-5D-5L. Moreover, personal and demographic information and the impact of the events related to the COVID-19 pandemic are assessed in questionnaires (box 2). The exported files from the survey module of the e-health platform are prepared for further data analysis by a research associate (Institute for Sex Research), stored encrypted and forwarded to all evaluating units of the three UKE institutes. Statistical software used is STATA V.17 or newer, R V.4.1.2 or newer, SPSS V.27 or newer, Python V.3.10.1 or newer.

Biometric evaluation

Descriptive statistics will be presented by group and for the total sample. The primary analysis will be based on the ITT, which includes all randomised participants. Missing values at follow-up are replaced by the baseline values (Last observation carried forward (LOCF) imputation), which corresponds to no change during the intervention period and hence the worst-case scenario[53] for the treatment effect. A baseline adjusted linear model, that takes the change in symptom burden (BSI-18) from baseline to 4 months as dependent variable and study group (intervention vs control) as independent variable, is fitted to the data. The contrast between both groups will be assessed in a confirmatory manner. The resulting statistical test for group comparison is performed two-sided at the 5% significance level.

Three sensitivity analyses will be performed, by using (1) the complete case analysis set (ITT), (2) the per-protocol

analysis (PP) set, (3) a multiple imputated dataset, in case of more than 5% and less than 40% excluded participants in the primary analysis.[53] In particular, the PP population includes all participants attended at least four of the eight scheduled meetings and have no further major protocol violations. The analysis of secondary outcome measures is performed exploratively without adjustment for multiplicity and in a similar way as the primary analysis calculating a baseline adjusted linear model. Additionally, several subgroup analyses with respect to participant related characteristics will be carried out. Adjusted effects with their 95% CIs and p values will be reported. Interim analyses are not planned. A detailed statistical analysis plan will be prepared by the Institute of Medical Biometry and Epidemiology, UKE and finalised before unblinding of the study group. Results will be reported according to the Consolidated Standards of Reporting Trials statement.[54]

Health economic analysis

For the cost-effectiveness analysis, direct and indirect costs will be calculated from the societal and health care payers' perspective based on health care utilisation and lost productivity at work measured with the CSSRI.[51 55] Health effects will be assessed using quality-adjusted life-years (QALYs), based on preference-based scores of health-related quality of life derived from the EQ-5D-5L.[49 56] Costs and health effects of i²TransHealth will be compared with the control (waiting) group in an incremental cost-effectiveness ratio, the ratio of the difference in costs and the difference in health effects between i²TransHealth and the waiting group.[57] In order to consider statistical uncertainty in the data and the effect of potential confounding variables, cost-effectiveness acceptability curves will be constructed based on net benefit regressions using different willingness-to-pay thresholds.[58]

Qualitative and quantitative process evaluation

Based on self-assessments using VSE, the increase in knowledge, skills, and expertise in dealing with trans clients in a clinical setting is recorded. At the beginning of the recruitment phase, the cooperating physicians are asked to rate their level of knowledge regarding specific learning goals (eg, 'I can name the problems of trans persons in the health care system') on a six-level scale from 'very much agree' to 'don't agree at all'. This self-assessment is repeated at the end of the recruitment phase. By dividing the difference in mean value (pre–post) for a specific learning objective by the corrected mean value of the initial self-assessments of all network physicians, the increase in the learning objective is calculated as a percentage.[52]

The scores from the physicians' answers on satisfaction with the support of i²TransHealth according to a modified version of ZUF-8[50] are descriptively presented with frequency distributions. In the context of the qualitative part of the process evaluation, data are collected to analyse inhibiting or beneficial aspects and to contribute to the improvement of the network structure in terms of formative evaluation or to provide practice recommendations for the continuation and expansion of i²TransHealth.

The collected data will be supplemented by a quantitative-qualitative process evaluation at the end of the study. For this, we invite the cooperating physicians, the study therapists and 10% of the study participants from the intervention group to semi-structured internet-based group discussions. Study participants were selected to reflect diversity in sex assigned at birth (female, male), gender (binary, non-binary), age, place of residence (urban or suburban/rural) and assigned study therapist. Four group discussions will be conducted (primary care physicians, psychiatrists, study therapists and service users), audiotranscribed and qualitatively analysed.

DISCUSSION

HCPs who provide transition-related health care are looking for sensible solutions in order to offer trans-informed support to those seeking treatment, regardless of their place of residence. Thus, in this RCT, we are examining whether an internet-based health care programme including video consultations and a physicians' network like i²TransHealth can substantially improve and complement trans health care. i²TransHealth is meant to answer relevant questions regarding costs, efficiency and effectiveness of the model.

The i²TransHealth model can have the following limitations: (1) An insufficient number of participants from rural areas participates due to a lack of trust in the internet-based health care programme; (2) lack of a valid measurement for the desired effects of the primary outcome; (3) The 4-month intervention duration can be critically questioned, particularly in relation to its effectiveness on secondary outcomes. Given comparable RCTs that conducted their internet-based interventions over a 4-week or 5-week period[44–47], the intervention duration in our trial is considerably longer. Combined with considerations of study feasibility, funding period and sample size, we, therefore, decided to design the study with a 4-month intervention phase. (4) The sample size was calculated to detect a difference between intervention and control group for change in the BSI-18 cumulative score from baseline to 4 months. Therefore, the calculated sample size might be too small to observe significant differences in costs and QALYs. However, in order to not mislead interpretation, uncertainty around cost-effectiveness will be represented using, for example, cost-effectiveness acceptability curves. (5) i²TransHealth was planned before the COVID-19 pandemic and we completed the development before the outbreak. However, the COVID-19 pandemic introduces a bias in data collection that will be difficult to

determine, because inequalities and health risks faced by trans people have increased.[21 59]

Modern technologies are now strongly recommended in order to offer rural LGBTQIA+ people gender-reflective health care regardless of where they live, but still need to be adequately tested for their effectiveness. E-health is a promising tool,[60 61] with research on rural and non-rural residing trans people arguing for it.[23 24]

i²TransHealth is specifically designed for trans people living in rural or suburban areas outside a metropolis. Although the first e-health projects for trans people have already been tested, such as a non-randomised pilot study for trans women in Washington, DC,[62] only i²TransHealth, as an RCT, is currently evaluating cross-sectoral digital clinical care. As far as we know, it is unique in its kind. Moreover, we are trying to compensate for the lack of education and training of HCPs as an expression of structural discrimination[63] by setting up a physicians' network. With regard to the long-term reach of i²TransHealth to improve access to interdisciplinary trans health care, there is a need to introduce location-independent models of care into reimbursed regular care. For this, a positive evaluation of our approach is essential.

i²TransHealth might enable the synergies of trans health care specialists and associated physicians from a catchment area with four federal states around Hamburg, Germany. i²TransHealth is designed for long-term sustainability. We hope that our concept can be transferred into regular care once the study is completed and evaluated positively.

ETHICS AND DISSEMINATION

The ethics committee of the Hamburg Medical Association has given ethical approval (PV7131). All participants gave their informed consent and received information about the study objectives, voluntary participation, their right of withdrawal and the risks and benefits of the study. Study therapists asked participants to sign two copies of the informed consent form. The consent forms should be kept separate from the data. The pseudonymised data will be kept under lock and key. All digital or electronic records are password protected. Only the PI and research associates may access the original data for research purposes.

i²TransHealth should not cause any physical or psychological harm, although we cannot exclude possible side effects such as a possible worsening of previous problems or the occurrence of difficulties in the course of e-health treatment. If unforeseen problems occur or if the participant feels discomfort or anxiety during the study, the study therapists will report this to the PI. In the event of a possible drop-out of participants, a justification for their drop-out will be requested 4 months after their participation in the study.

Process evaluation began in 2021, and statistical analyses will take place in 2022. A symposium will close the project. In addition, the subsequent publication activities balance the study (via implementation manual, final report, articles). The study results are made available to participants and their families through the media, to HCPs through professional training and meetings, and to researchers through conferences and publications.

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