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Patient heterogeneity in the implementation of a supportive oncology care model: a longitudinal type-building qualitative content analysis

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Abstract

Background: Implementing supportive care models in oncology depends on patient engagement, and understanding heterogeneity in patients' needs, awareness and access is crucial for optimising reach, acceptability and appropriateness in outpatient oncology. This analysis aimed to develop a longitudinal patient typology within the implementation of the OnCoPaTh supportive care model, which combines structured patient coaching with early palliative care integration, and to examine the typology's contribution to understanding such implementation processes.

Methods: This secondary analysis examined longitudinal qualitative data from patients with advanced cancer in German outpatient oncology. Patients were intervention-group participants in the OnCoPaTh cluster-randomised controlled trial, an initial implementation study. Semi-structured interviews with a purposeful sample were conducted at three time points approximately six months apart. Data were analysed using stepwise type-building qualitative content analysis (QCA) comprising structuring, evaluative and type-building steps.

Results: Altogether, 37 interviews from 16 patients were analysed, including 30 from 10 with complete longitudinal follow-up. Four patient types were identified across these patient-time-point observations: (1) the needy – the prototype, who engaged actively and reported support from the OncoCoach; (2) the satisfied, who had access to the intervention but perceived no need for additional support; (3) the correctly unreached, whose low perceived needs made non-engagement appropriate; (4) the falsely unreached – missed opportunity, who indicated unmet needs yet reported little or no awareness of, or engagement with, the OncoCoaching component. Half of the patients with complete follow-up remained in the same type over time and the remainder transitioned as their well-being, care needs, awareness and preferences evolved. Early palliative care featured only marginally in patients' accounts across all types, reflecting entrenched negative associations and, reportedly, limited introduction of the component.

Conclusions: Type-building QCA captures patient heterogeneity in supportive oncology care implementation, illuminating variation in reach, acceptability and appropriateness that aggregate analyses obscure. The typology points to missed opportunities among falsely unreached patients and to the importance of intervention visibility, proactive communication and individually tailored delivery. Non-reach therefore cannot be read as implementation failure without a joint judgement about appropriateness.

Trial registration: DRKS00023255 (German Clinical Trials Register), retrospectively registered on 5 November 2020.

Contributions to the literature

- Patient-level explanations for uneven uptake remain scarce. This study shows how patients' needs, awareness and access relate to reach, acceptability and appropriateness of a complex supportive care model.

- Implementation research typically treats non-reach as failure. This study distinguishes patients for whom non-engagement was appropriate from those with unmet needs the intervention never reached, showing that reach cannot be interpreted without appropriateness.
- Qualitative implementation studies rarely follow patients over time. This study traces how patient needs and engagement evolve across the illness trajectory, informing ongoing implementation.
- It also shows how type-building qualitative content analysis can be combined with implementation outcome taxonomies.

Background

Supportive care interventions are increasingly recognised as essential components of high-quality oncology care, particularly for patients with advanced cancer who experience complex and evolving physical, psychosocial and informational needs [1–5]. To address these multidimensional demands, supportive care is often delivered through complex interventions that combine multiple interacting components across several care settings and require sustained engagement from patients and healthcare professionals to meaningfully affect established care pathways [6, 7]. Despite their potential to improve patient-centred outcomes, such interventions remain difficult to implement effectively in routine oncology care [6, 8].

Implementation barriers arise at patient, professional, team, organisational and system levels, and effective strategies therefore tend to be tailored rather than uniform [9]. In oncology, the patient level carries particular weight, as organisational complexity and substantial patient heterogeneity jointly shape reach, acceptability and appropriateness [10–12]. Oncology patients differ substantially in their needs, preferences, health status and readiness to engage with supportive care, which shapes how interventions are perceived and used [13–16]. Yet implementation research often relies on aggregate analyses that emphasise average effects and risk obscuring within-group variation, limiting insight into why interventions benefit some patients but not others [17]. Complex supportive care models, such as those combining structured patient coaching and early palliative care integration [18, 19], may benefit from approaches that look beyond aggregate outcomes to capture heterogeneity in patient engagement and response over time [17, 20–23].

Type-building approaches offer a qualitative means of exploring this heterogeneity among groups such as patients or practitioners [24, 25]. By identifying patterns across multiple attributes, such as patient characteristics and supportive care needs, type-building yields empirically grounded typologies that capture meaningful differences in experience and engagement [26, 27]. Applied longitudinally, type-building can illuminate changes in patient needs and interactions with intervention components. Type-building via qualitative content analysis (QCA) provides a stepwise, transparent and replicable procedure for identifying distinct types and is therefore well suited for examining target groups in depth [26]. Because each type reflects a distinct configuration of need, engagement and context, the resulting typology offers a structured basis for interpreting the implementation outcomes of reach, acceptability and appropriateness [10, 12] at a granularity aggregate analyses cannot provide. RE-AIM [12] structured

the data collection underlying this analysis. The typology itself is interpreted through these three outcomes.

Despite their potential, type-building approaches remain underused in qualitative research more broadly [28] and are applied still less often in implementation science, particularly from patient perspectives. Applications combining type-building with longitudinal qualitative designs to capture patient heterogeneity are especially scarce in supportive oncology care, where longitudinal work has so far relied predominantly on quantitative trajectory modelling of needs rather than qualitative typology construction [29]. Guidance on integrating these approaches systematically to deepen understanding of relevant target groups also remains limited.

Against this background, we applied a stepwise type-building QCA approach [26] within the implementation of a supportive care model in German outpatient oncology. This study is a supplementary secondary analysis [30] of qualitative data collected within the OnCoPaTh (OncoCoaching and Early Palliative Care as Patient-Centred Care Elements in the Treatment of Advanced Cancer) project evaluation. Focusing on patients with advanced cancer in the intervention group, we aimed to develop a patient typology reflecting variation in experience and engagement with both core components of the OnCoPaTh supportive care model. We further aimed to identify implications for the implementation of complex supportive care models. Our analysis addresses the following research questions:

- Which patient types emerge from longitudinal, semi-structured interviews with patients participating in the implementation of a complex supportive care model, and how distinctly can these types be differentiated from one another?
- To what extent can the results of a type-building approach contribute to understanding and working with the implementation process of a new supportive care model?

Methods

Study context – OnCoPaTh

This secondary analysis draws on interview data collected from intervention-group patients during implementation and evaluation of a supportive care model. The OnCoPaTh project was conducted between October 2020 and March 2024 in outpatient oncology settings, including medical care centres, private practices and hospital outpatient clinics, across Germany [31]. These facility types differ structurally. Private practices are typically small, physician-owned units. Medical care centres are larger, multi-specialty facilities with salaried physicians. Hospital outpatient clinics are hospital-affiliated units embedded within larger organisational and staffing structures. OnCoPaTh was implemented and evaluated as a new care model funded through the Innovation Fund of the Federal Joint Committee, which supports time-limited implementation of new care models in routine practice.

The supportive care model in OnCoPaTh aimed to optimise patient-centred supportive care for patients with advanced cancer through an outpatient, multiprofessional model integrating early palliative care delivered by a Palliative Care Nurse Consultant (PCNC) and structured patient coaching (OncoCoaching) provided by a specialised oncology nurse (OncoCoach). As designed, the OncoCoach acts as a patient-centred bridge within the oncology care team, facilitating communication, coordination and individualised supportive care, while educating patients about their diagnosis, treatment and potential side effects, addressing non-medical concerns and supporting their self-determination and decision-making. The OncoCoach forms part of the core care team alongside the treating oncologist and cooperates with the PCNC to improve the quality and patient-centredness of oncology care and to address patients' supportive care needs [32, 33]. Access to the PCNC is facilitated through the OncoCoach, who identifies patients with relevant needs and initiates referral, so patients do not contact the PCNC independently.

A cluster-randomised controlled trial was conducted with two study groups. The **intervention group (IG)** followed a structured implementation process, comprising guided workshops and individual follow-up sessions at participating organisations after initial implementation. Through these strategies, the IG received structured support for integrating the model's core elements, **OncoCoaching** and **early palliative care, and for establishing interprofessional collaboration among care providers**. The **control group** also applied OncoCoaching and had access to PCNCs for early integration of palliative care, but without structured support [31].

Study design and data collection

Patients' experiences were explored using a longitudinal qualitative design to capture both immediate and evolving perspectives on the OnCoPaTh supportive care model and participants' illness trajectories. Data were collected through **semi-structured telephone interviews** with IG patients only. All participants provided written informed consent prior to data collection. Interviews were conducted individually at three measurement time points (T2, T4, T6) of the parent trial, corresponding to approximately six, twelve and eighteen months after each patient's study enrolment, between March 2023 and April 2024. If a participant was unable to continue for health-related or other reasons, an additional eligible patient matching the sampling criteria (see Participants and sampling) was recruited at the corresponding time point. This substitution preserved cross-sectional density at each time point but not individual-level longitudinal continuity for affected trajectories. Following each interview, the interviewer documented brief field notes capturing contextual aspects of the conversation and immediate reflections.

All interviews were conducted in German. For publication purposes, interview guides, analytical materials and participant quotations were translated into English by the research team. Original meaning and tone were preserved, with the German wording consulted throughout the analysis.

The interview guide developed for this study adapted RE-AIM's five dimensions (reach, effectiveness, adoption, implementation and maintenance [12, 34]) into patient-facing questions, supplemented by

researcher-developed questions tailored to the OnCoPaTh care model. Patient acceptance was included as a sixth main category alongside the RE-AIM dimensions. The interview guide was **pilot-tested and iteratively refined** after each data collection time point (see Additional file 1). Although originally developed as a programme-level planning and evaluation framework, RE-AIM describes aspects of implementation that patients can report from their own experience, unlike frameworks centred on organisational determinants or provider practices. Qualitative applications at the individual participant level are established practice, supported by the RE-AIM Working Group's own interview-guide templates [35] and methodological guidance [36]. RE-AIM also structured the parent project's evaluation and was thus carried forward into this secondary analysis.

With additional consent, all interviews were audio-recorded, transcribed verbatim using content-semantic transcription [37] and pseudonymised, allowing linkage across time points.

Participants and sampling

Eligible participants were adults diagnosed with distant metastatic tumours, with full decision-making capacity, and affiliated with a participating oncology institution. Purposeful sampling was used to ensure representation of diverse patient experiences and contexts [38]. Patients were selected by the sampling criteria of facility type, gender and age (rationale in Table 1). A matrix combining these criteria identified 18 potential patient profiles for maximum variation. Formal data saturation was not determined [39, 40]. Sampling instead aimed to cover the predefined variation matrix as comprehensively as possible.

Table 1 Sampling matrix

Axis of Diversity	Operationalised Selection Criteria	Rationale for Operationalisation
Facility type	Three groups: 1. Medical care centres 2. Private practices 3. Hospital outpatient clinics	Care delivery (e.g. intensity and organisation of intervention components) and implementation conditions (e.g. staffing, workflows, available resources) of the OnCoPaTh supportive care model may vary across facility types, potentially shaping how the intervention is delivered and how patients experience and engage with it.
Gender	Two groups: 1. Male 2. Female	Patients' experiences of OnCoPaTh may differ systematically based on gender, as supportive care needs, help-seeking behaviour, communication preferences and perceptions of psychosocial support can vary by gender.
Age	Three groups: 1. <60 2. 60–70 3. >70	Patients in different age groups may experience the OnCoPaTh care model differently due to variations in life stage (e.g. social and family environment), health status (e.g. disease trajectory), digital or health literacy and expectations towards supportive care, which may influence engagement with and perception of the intervention.

Data analysis

Data were analysed using qualitative content analysis (QCA) following the stepwise approach described by Kuckartz and Rädiker [26], with type-building QCA as the central analytical goal, applied across the three longitudinal interview time points (Figure 1). The analysis draws on three principal elements with clearly separated roles. Methodologically, Kuckartz and Rädiker's approach provided the analytical procedure, comprising structuring, evaluative and type-building steps. The RE-AIM framework served as the structuring scaffold for the interview guide and the deductive main categories in the first analytical step. In the interpretation phase, the resulting patient types were situated within established implementation science outcomes, drawing on the RE-AIM construct of reach [12] together with acceptability and appropriateness from Proctor et al.'s implementation outcomes taxonomy [10]. The taxonomy was selected for its discrete, widely applied outcome definitions, which distinguish implementation from service and client outcomes, these three being the outcomes most directly assessable at the patient level. This separation was maintained throughout the analysis.

1st step: Structuring QCA

All interview transcripts were read repeatedly and memos written to gain familiarity with the data. Deductive main categories were derived from the interview guide (aligned with RE-AIM dimensions and patient acceptance), and subcategories were developed inductively through line-by-line coding. Category

systems were developed for each time point and adapted to evolving implementation and project phases.

Coding was conducted in MAXQDA [41] by the lead researcher (MM) and reviewed iteratively by two additional researchers (LT, JB) for plausibility, clarity and consistency. Discrepancies were resolved through consensus and category definitions were refined.

2nd step: Evaluative QCA

Thematic categories from Step 1 were selected as evaluative categories defining the attribute space for type-building (Additional file 2), enabling structured cross-case comparison as the analytical foundation for typology development (Step 3). As the interview guides included elements serving the primary project evaluation (e.g. a specific block on implementation outcomes at the final data collection time point), the evaluative categories and attribute space for type-building were restricted to categories consistently assessed across all three time points. Each evaluative category was assigned discrete levels based on its coding units. For example, the evaluative category *Perceived impact of the OnCoPaTh study on patients' lives* comprised five levels: ***high influence, influence, low influence, no influence*** and ***unable to classify***.

For each interview time point, a structured case summary table was created in Excel, assigning each patient (case) a level for each evaluative category (attribute). Category selection and level assignment were discussed in consensus meetings involving JB, with a third researcher (LT) consulted in cases of disagreement.

3rd step: Type-building QCA

Type-building groups cases by similarities and differences across selected attributes (attribute space), defined by evaluative categories and their levels [26, 27]. Using the case summaries, cases were iteratively and systematically compared and contrasted across the attributes reflecting core aspects of patient experience (e.g. *Wishes for further care by the oncology facility* or *OncoCoach support*) to identify patterns and derive empirically grounded clusters ("natural types") [26].

Steps 2 and 3 were revisited iteratively to refine the attribute space and clarify emerging patterns. Cases at the boundary between types were assigned through consensus discussion (MM, JB), with a third researcher (LT) consulted where agreement was not reached. The longitudinal design enabled identification of both stable and changing patient profiles, informing interpretation of reach, acceptability and appropriateness.

Methodological rigour and reflexivity

Rigour was pursued through iterative, team-based analysis, regular consensus meetings and multiple researchers' involvement in coding review, evaluation and type-building. Formal member checking was not conducted given the interpretive nature of the type-building process and the advanced illness of participants. However, the longitudinal design provided repeated opportunities to verify understanding of individual trajectories across interviews. Analytical decisions and preliminary findings were discussed within the broader research team and in an interdisciplinary qualitative research group, providing external methodological input. Reflexivity was addressed through continuous reflection on how researchers' backgrounds, roles and prior project involvement might shape interpretation. This was particularly relevant as most of the analytical team was affiliated with the group implementing and evaluating OnCoPaTh. Specific attention was paid to the risk of interpretations aligned with implementation expectations rather than patient narratives. Further details are provided in Additional file 3. Reporting followed the Standards for Reporting Qualitative Research (SRQR) [42] and the Consolidated Criteria for Reporting Qualitative Research (COREQ) [43]. The completed checklists are provided as Additional files 4 and 5.

Generative AI (Claude, Anthropic) was used for language editing and revision of author-drafted text. It was not used for data collection, coding, type-building or interpretation.

Results

Sample characteristics and interview participation

A total of 39 interviews were conducted with oncology patients (T2: 13, T4: 14, T6: 12). A pretest interview at T2 and a replacement interview at T4 (due to health-related dropout) were excluded from the analysis, resulting in 37 interviews from 16 patients.

Ten patients participated at all three time points, one at two and five at a single time point, yielding 30 interviews for the longitudinal analysis. The sample comprised seven female and nine male patients. Four participants received care in private practices, seven in hospital outpatient clinics and five in medical care centres. Three participants were younger than 60, six were aged between 60 and 70 and seven were older than 70.

Interview duration ranged from 3 to 53 minutes (mean 15 minutes; T2: mean 15 minutes, T4: mean 12 minutes, T6: mean 18 minutes). The shortest interviews occurred at follow-up (T4, T6), when patients frequently reported unchanged situations, requiring little further elaboration. All interviews were retained, as they provided sufficient codeable content for type-building and preserved the longitudinal structure for affected patients. Figure 2 presents an overview of participation and sample characteristics.

Constructed types

Types were constructed from the attribute space summarised in Table 2. The type frequencies below (Types 1–4) describe the 30 patient-time-point observations from the ten patients with complete data across all three interview time points. The seven observations from the six patients with partial participation are excluded. The type labels used below are analytical shorthand chosen for clarity and memorability, describing empirically derived patterns rather than judgements about individuals. Level labels in the type descriptions are abbreviated. Their parent attributes appear in Table 2, with full attribute and level definitions in Additional file 2.

Table 2 Attribute space underlying the type-building process

Attribute
Current well-being and experiences of the illness and care situation
Perceived OncoCoach support
Palliative care support – Perceived support by a Palliative Care Nurse Consultant
Perceived effort associated with participating in the new care model
Wishes for further care by the oncology facility
Engagement with palliative care and perceived timing of relevance
Perceived impact of the OnCoPaTh study on patients' lives
Assessment of staff competencies (particularly the OncoCoach) at the oncology facility
Hope associated with study participation
Willingness to recommend care provided by an OncoCoach

OncoCoach support emerged as the decisive attribute differentiating patients' reported access, receipt and intensity of intervention engagement. The remaining attributes assessed patients' perceived need for supportive care and alignment with the intervention. Although *early palliative care* via the *PCNC* was a core element and a potential evaluative attribute, only one level (*No support*) occurred across the sample, leaving it without discriminating power. Several categories (perceived effort, staff competence assessment and perceived study impact) showed only a subset of their defined levels. The typology was therefore structured around the attributes that varied, principally OncoCoach support and those reflecting perceived need for support. Four patient types were identified.

Role of early palliative care and PCNC support within patient narratives

Across types and time points, patients reported no contact with the PCNC component and little awareness of it. Reported engagement remained low or critical throughout (levels *Limited or uncertain engagement* / *No engagement / rejection / not relevant*). When palliative care was mentioned, it was often

associated with negative connotations that patients sought to avoid, or was interpreted as imminent death and end-of-life care. For example, P3 stated: "*No, no, no. I don't want to die yet. […] Well, you see, now we're back at that point again. Yes, palliative care – it always sounds so… so final, like death.*" Patients noted, however, that they could access it at any time if needed.

In contrast, some patients reported prior experience through their social networks, which made them less fearful or even receptive, e.g. P8: "*[…] I think palliative care is not something negative. […] I've seen it with my brother. […] I would go there immediately if it's necessary.*" Nonetheless, almost none considered it relevant to their current situation.

Few patients reported *Initial engagement / preparatory orientation,* for example contacting a palliative care unit on their oncologist's recommendation to seek advice, familiarise themselves with the service and make initial contact.

Type 1: the needy – the prototype

The first type (10 observations; T2: 3, T4: 3, T6: 4) comprised patients who were reached by the OncoCoach component and described receiving regular or intensive OncoCoach support (levels *OncoCoach involved with intensive support* and *OncoCoach involved with support provided*).

They reported *moderate* to *very good current well-being and care situations* yet still perceived the intervention as beneficial. These patients experienced their participation in the new care model as low-burden, corresponding to the levels *Little or minimal effort* and *No effort (at all)*. They expressed satisfaction with existing care and primarily wished for care by the oncology facility to continue unchanged (*Wish: Care should continue as it has been*). Patients described staff competencies, particularly the OncoCoach's, consistently as *good* to *very good* (levels *Very competent / Very good* or *Competent / Good*). Despite this positive assessment, patients reported little to no direct impact on their daily lives (*No impact* and *Little impact*).

Type 2: the satisfied

The second type (7 observations; T2: 1, T4: 3, T6: 3) comprised patients who were structurally reached by the intervention and aware of *having access to an OncoCoach* but reported *no or very limited engagement* (level *OncoCoach available, but support not or hardly utilised*). Reasons for non-use often included a perceived lack of personal need, e.g. P3: "*Yes, I have an OncoCoach, but I have had very little contact with her. She told me to reach out immediately if anything came up, but so far I haven't felt that I needed to.*"

Patients perceived *no impact* and did not expect personal benefit from participation, although several described altruistic motives (level *No expectations from participation – participated for altruistic reasons*), e.g. P1: "*No. It was more a matter of give and take. You are conducting research so that certain situations,*

let me put it this way, can be improved in the future." Even in cases of *lower well-being*, patients did not articulate additional support needs and wished for care to continue as it had been. Patients described *staff competencies* as *(very) good* and indicated willingness to *recommend the OnCoPaTh supportive care model to others*.

Type 3: the correctly unreached

The third type (8 observations; T2: 2, T4: 3, T6: 3) comprised patients who reported *no support from the OncoCoach* or no consciously perceived contact. Most of them described their *current well-being and care situation* as *moderate* to *very good*.

Patients indicated that existing care sufficiently addressed their needs or that only minimal to no *wishes for further care by the oncology facility* remained, e.g. on *OncoCoach support* P12: "*No, not really. I didn't really feel it was necessary, to be honest.*" Consequently, they did not express a need for additional support. Although these patients should have had access to the intervention, their non-engagement with the OncoCoach appeared appropriate given their low perceived need. Patients also reported *staff competencies* in general as *(very) good*. Most patients also *did not expect personal benefit* but *participated for altruistic reasons*.

Type 4: the falsely unreached – missed opportunity

The fourth type (5 observations; T2: 4, T4: 1, T6: 0) comprised patients who, like those in Type 3, reported no OncoCoach contact, although they should have had access. In contrast to the correctly unreached, their interview narratives revealed unmet needs, such as a desire for additional social support, as well as *concrete wishes*, including hopes for curative treatment of their oncological disease, e.g. P4: "*What I'm actually missing a little bit is the social support. So, what options do you have? What can you do? I mean, aside from purely medical care. […] what you, I think, what you refer to as coaching.*" Although patients subjectively reported no access to or engagement with the intervention, their expressed wishes and the case context suggest they may have benefited from active guidance through the OnCoPaTh care model.

Reduced typology and cross-type interpretation

While the full typology is grounded in ten attributes, the types can be summarised along two core dimensions for interpretive clarity, defined as follows:

1. Intervention access: Covers patients' awareness of, access to and engagement with the OncoCoaching component.
2. Perceived need for support: Based on patients' well-being and perception of the illness and care situation, wishes for further care by the oncology facility and hope associated with study participation – i.e. whether the patient felt the intervention was necessary or beneficial.

The four types can be positioned within a two-dimensional matrix (Figure 3).

Longitudinal patterns across types

Five patients were assigned to the same type at each time point (Figure 2).

Two patients (P1, P2) transitioned from Type 4 to Type 3, reflecting a change in their *wishes for further care by the oncology facility* as their existing care situation became sufficient or they expressed hopes for complete cure of their cancer (P2: "*That I become completely healthy again. (laughs)*"), which lies beyond what the intervention could realistically influence. This reflects an analytical judgement that these wishes did not co-occur with other intervention-addressable needs, not that no supportive care needs remained.

P5 moved from Type 3 via Type 2 to Type 1 across the three interviews. The patient initially reported no OncoCoach involvement and very good well-being (P5: "*I don't need a nanny*"), then declining well-being with awareness but non-use (Type 2) and finally regular OncoCoach contact extending beyond study topics (Type 1).

Two further patients transitioned from Type 4 to Type 2. P4 reported no OncoCoach contact in the first two interviews despite wishing for such support. In the final interview, he reported an intensive conversation with the OncoCoach but concluded she could not help him: P4: "*[…] Yes, what is she supposed to do with me? What does she want to do? She can't help me.*" P7 initially preferred to cope on her own without an OncoCoach. By the second and third interviews, she was aware of the option but chose not to use it, perceiving no need for additional support.

Discussion

This longitudinal qualitative analysis revealed four patient types differentiating intervention access from perceived need, half of them stable across time points, which we interpret below in relation to reach, acceptability and appropriateness.

Key findings and interpretation

Only Type 1 patients reported receiving OncoCoach support and perceiving it as beneficial, yet attributed no substantial change in daily life to the intervention, likely because intervention components such as the OncoCoach were experienced as part of routine care rather than as a discrete intervention [44, 45]. Type 2 patients were aware of the intervention and could access it but perceived no need for additional support, underscoring that availability alone does not ensure acceptability and engagement. Patients must recognise a need and perceive the intervention as relevant and accessible, while organisations sustain its integration into routine care [46–48]. These observations align with Consolidated Framework for Implementation Research (CFIR) constructs such as Patient Needs and Resources and Access to

Knowledge and Information [49, 50], used here as an interpretive lens rather than as an a priori coding framework.

Types 3 and 4 pointed to challenges of reach and appropriateness. For Type 4, patients reported needs consistent with the intervention's objectives yet no awareness of, or contact with, the OncoCoach, suggesting the role was inconsistently communicated or insufficiently visible, which represents a missed opportunity for reach. Alternative explanations cannot be ruled out. Differences in recruitment pathways, in how the OncoCoach role was operationalised across facilities or in facility-type sampling composition may also have contributed, and Type 4's small case number makes this an illustrative rather than exhaustive account.

Limited engagement among Types 3 and 4 may reflect perceived inappropriateness or mistiming rather than deficiencies in delivery, underscoring the value of patient-level perspectives when evaluating implementation success. Across types, the findings point to a need for proactive communication, clear intervention visibility and individually tailored delivery to strengthen reach, acceptability and appropriateness.

Early palliative care

No patient reported PCNC contact across interviews and time points, so these findings concern non-exposure rather than acceptability. Patients had no opportunity to evaluate a component they never received. This non-exposure aligns with patients' persistent association of palliative care with terminal care and imminent death, a misconception that directly undermines the rationale for early integration and is consistent with prior research [51, 52].

Patients' accounts suggest the PCNC component was rarely introduced to them, indicating a gap in the delivery pathway that directly affected the reach of early palliative care. Awareness therefore remained low, and perceived relevance appeared to increase mainly with worsening symptoms or functional decline rather than at diagnosis [53]. Existing social support networks also reduced some patients' perceived need for formal support. Why introduction rarely occurred cannot be established from patient data. Provider-level factors such as difficulty raising the topic or judgements about timing would require separate investigation.

These findings reflect known barriers to early palliative care uptake, including misconceptions, communication challenges and timing issues [54, 55]. Information alone appears insufficient: effective introduction combines focused clinical communication, trust-building and integration into routine care pathways, normalising palliative care as supportive rather than terminal [56, 57]. The low visibility of the PCNC component may therefore reflect an implementation challenge in which the way and timing of palliative care introduction matter alongside the availability of the service itself.

Longitudinal dynamics

Rather than assigning each patient a single static type, the longitudinal analysis showed type membership to be dynamic. Patients transitioned as their well-being, care needs, awareness of intervention components and wishes for care evolved. These dynamics highlight how **supportive care needs fluctuate over the cancer trajectory** and the value of repeated over single cross-sectional assessment [58–61].

Two transition patterns were particularly informative. The shift from Type 3 to Type 2 reflected growing awareness of and access to the intervention without a corresponding increase in perceived need. Transitions from Type 4 to Type 2 suggested that previously unmet needs diminished as patients gained awareness of available support or as preferences shifted towards maintaining existing care arrangements (*Wish: Care should continue as it has been*). Both patterns may reflect improvements in implementation processes over time, as no patient remained falsely unreached at T6, although attrition limits this interpretation. From an implementation perspective, these longitudinal dynamics underscore the importance of repeated patient assessment during intervention delivery.

Organisational context and implementation setting

Notably, all patients assigned to Type 1 were treated in hospital outpatient clinics. As this analysis draws on patient accounts rather than facility-level data, this observation is offered as a hypothesis-generating pattern rather than evidence of a setting effect. CFIR points to inner setting characteristics such as leadership engagement, resources and implementation climate as plausible explanations for facility-level differences [62]. Structured hospital outpatient clinics may offer more favourable conditions than smaller settings such as private practices or medical care centres [63]. No notable differences across patient types were observed for age or gender, the other two sampling criteria.

Comparison with the literature

Although type-building approaches remain rare in implementation science, our typology extends research capturing heterogeneity in intervention engagement and implementation processes.

Typologies have described variation in healthcare team functioning, suggesting tailored implementation strategies [64]. Engagement with behavioural and public health interventions has also been shown to depend on individuals' perceived needs, life contexts and goals [65], consistent with the variation in openness to OncoCoach support and early palliative care observed here. The distinction between intervention access and perceived need aligns with evidence that supportive care needs vary systematically by cancer type, age and treatment status [66], supporting the value of tailoring supportive care rather than assuming uniform demand across patients. Riley and Hawe used a qualitative typology of implementer practice patterns to explain variability in community intervention uptake [67]. We extend

this logic to the patient level, showing that engagement patterns vary in structured ways and that patient typologies can illuminate reach, engagement and appropriateness.

Methodologically, the stepwise procedure applied here [26] operationalises Kluge's principle of empirically grounded type construction [24], combining case-comparative qualitative analysis with theoretical interpretation.

Strengths and limitations

A key strength is the longitudinal design combined with a systematic type-building approach, which affords insight into heterogeneous and evolving patient engagement. The typology provides a foundation for further in-depth analyses, including integration with additional qualitative or quantitative data within sequential mixed methods designs [68], and may guide quantitative measure development or subgroup analysis.

Although maximum variation sampling was pursued, the longitudinal type-building analysis was restricted to patients interviewed at all three time points, so the intended variation was only partly realised. As non-continuation was largely health-related, these cases may over-represent patients with more stable disease trajectories, limiting the range of experiences available for type construction and the transferability of the typology. More diverse samples and richer case material are needed to extend the typology and capture greater heterogeneity.

As this analysis examined one specific supportive care model in a single national context, the distribution and characteristics of types should not be assumed to generalise to other interventions, healthcare systems or organisational contexts. The types identified and the type-building approach itself may nevertheless transfer conceptually to other supportive care models (combining patient coaching and early palliative care) and to other settings where patient needs evolve over time.

Although qualitative quality criteria and reflexive practice were applied throughout, the interpretive processes of category assignment, level development and typology construction may still have introduced researcher influence [69, 70] (see also Additional file 3). As the interview guide also served the primary project evaluation (e.g. a specific block on implementation outcomes at the final data collection time point), the attribute space was restricted to evaluative categories consistently assessed across all three time points. Brief interviews and relative homogeneity in parts of the data may have further limited differentiation between types.

The restricted range of observed levels in several evaluative categories has interpretive consequences. Most notably, as no PCNC contact was observed, these findings cannot speak to how patients would have experienced early palliative care had it been received. More broadly, the typology was necessarily structured around the attributes that varied, principally intervention access and perceived need. The resulting types should therefore be understood as reflecting the dimensions along which this particular

sample differed, rather than an exhaustive account of all theoretically relevant attributes. In a more heterogeneous sample, additional discriminating attributes might emerge, and the observed type stability may partly reflect changes falling within rather than between attribute levels.

Implementation outcomes such as reach, acceptability and appropriateness are inherently multi-stakeholder constructs, and provider, organisational and system-level perspectives may differ from patients' own accounts. As this analysis is based exclusively on patient interviews, the typology and its interpretation reflect patient-reported experience specifically. Future research incorporating provider and organisational perspectives would help triangulate and extend the patient-level findings presented here.

Conclusions

This study applied type-building QCA stepwise to deepen understanding of patients as a target group in the implementation of a supportive care model combining patient coaching and early palliative care (OnCoPaTh) in German outpatient oncology. Its principal contribution is methodological, demonstrating that a longitudinal, patient-level typology can reveal forms of implementation heterogeneity, particularly the "falsely unreached" pattern, that aggregate or cross-sectional analyses would not capture. Conceptually, the distinction between correctly and falsely unreached patients indicates that non-reach cannot be interpreted as implementation failure without a joint judgement about appropriateness. Given the limited number of longitudinal cases, the resulting typology should be understood as hypothesis-generating rather than as an established basis for targeting or resource-allocation decisions.

For intervention design, complex supportive care interventions such as OnCoPaTh should include clear, repeated communication about available support components and their relevance to patients. Assessing patient types and evolving care preferences over time can guide tailored delivery through patient-facing roles such as the OncoCoach, and help identify "missed opportunities" for reach among falsely unreached patients.

For clinical practice, our findings suggest that strengthening the visibility, timing and patient-centred communication of early palliative care may help address the pattern of "falsely unreached" patients observed here. Within the fragmented German outpatient oncology landscape, such changes would probably require coordinated action at multiple levels. Given the small number of cases underlying this pattern, this remains a hypothesis for practice-level attention rather than an established recommendation.

For implementation science methodology, future research should apply this approach in larger, more diverse samples to capture greater heterogeneity, corroborate the findings and develop strategies for increasing awareness and perceived relevance of supportive care among patients at risk of remaining falsely unreached.

Abbreviations

CFIR Consolidated Framework for Implementation Research

COREQ Consolidated Criteria for Reporting Qualitative Research

IG Intervention group

OnCoPaTh OncoCoaching and Early Palliative Care as Patient-Centred Care Elements in the Treatment of Advanced Cancer (the “Th” reflects the German original, “Therapie”, translated here as “Treatment” rather than the more literal “therapy”, for consistency with the broader scope of care addressed by the project)

PCNC Palliative Care Nurse Consultant

QCA Qualitative content analysis

RE-AIM Reach, Effectiveness, Adoption, Implementation and Maintenance (framework)

SRQR Standards for Reporting Qualitative Research

Declarations

Ethics approval and consent to participate

The Ethics Committee of the State Medical Association of Hessen issued a positive initial vote on 15 September 2020 (2020-1715-evBO). Positive second votes were obtained from the ethics committees responsible for oncology facilities in the seven other federal states (Baden-Württemberg, Bavaria, Bremen, Hamburg, Lower Saxony, North Rhine-Westphalia and Rhineland-Palatinate). All participants provided written informed consent prior to data collection.

Consent for publication

All participants provided written informed consent, which included consent to the publication of anonymised interview excerpts. No individually identifying information is reported. Quotations are anonymised and pseudonymised patient identifiers (e.g. P1–P16) are used throughout.

Availability of data and materials

The datasets generated and analysed during the current study are not publicly available. In accordance with participant consent agreements and German data protection regulations, the data may be used exclusively for the project evaluation and only by authorised members of the research team.

Selected, de-identified excerpts of the data (e.g. anonymised interview passages) and analytical materials (e.g. structured case summary tables or coding frameworks developed during the QCA

procedure) may be made available from the corresponding author on reasonable request, provided that sharing is consistent with participant consent and applicable data protection regulations.

Competing interests

The authors declare no financial competing interests. As disclosed in the Methods (Methodological rigour and reflexivity), several of the authors were affiliated with the research group responsible for implementing and evaluating the OnCoPaTh project (MM, LT, JKN), which constitutes a structural rather than financial conflict of interest. This is addressed through the reflexive practices described in Additional file 3.

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Authors' contributions

MM (corresponding author): Conceptualization, Formal analysis, Project administration, Methodology, Investigation, Visualization, Writing – original draft, Data curation, Writing – review & editing, Validation; LT: Project administration, Investigation, Methodology, Writing – review & editing, Data curation, Validation; SS: Validation, Writing – review & editing; HT: Conceptualization, Funding acquisition, Project administration; MW: Conceptualization, Funding acquisition, Project administration; CK: Validation, Writing – review & editing; JKN: Conceptualization, Funding acquisition, Supervision, Writing – review & editing, Validation, Project administration. All authors read and approved the final manuscript.

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Authors' information

Information on the researchers' disciplinary backgrounds, roles in the study and reflexive positioning is provided in Additional file 3.

Trial registration

DRKS00023255 (German Clinical Trials Register). The trial was registered retrospectively on 5 November 2020, after enrolment of the initial observational control cohort and before randomisation of the intervention and control arms.

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Figures

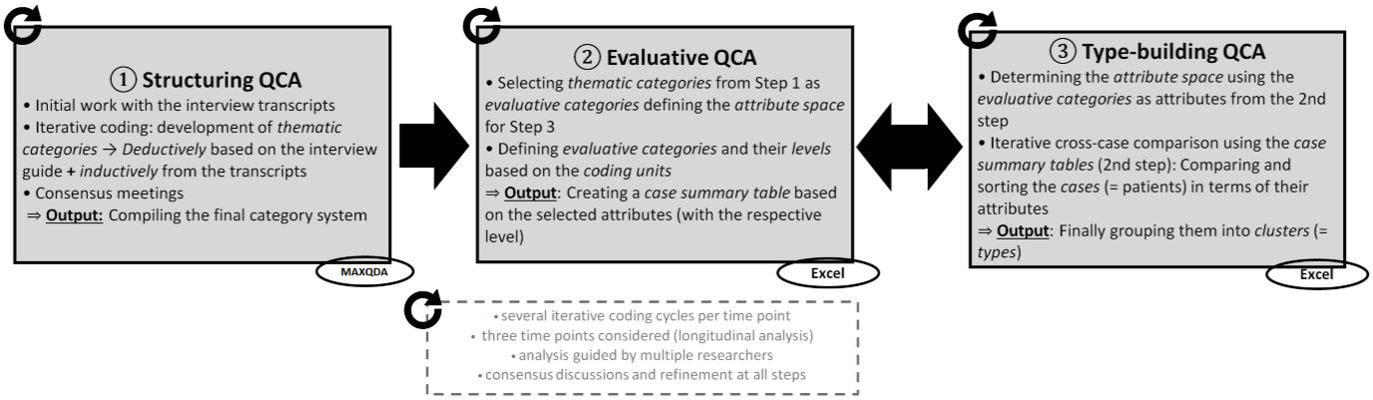


Figure 1

QCA process

Patient	Type — 1st interview time point (T2)	Type — 2nd interview time point (T4)	Type — 3rd interview time point (T6)	Facility Type	Gender	Age
P1	the falsely unreached – missed opportunity	the correctly unreached	the correctly unreached	Medical Care Centre	male	< 60
P2	the falsely unreached – missed opportunity	the correctly unreached	the correctly unreached	Private Practice	male	> 70
P3	the satisfied	the satisfied	the satisfied	Private Practice	male	60–70
P4	the falsely unreached – missed opportunity	the falsely unreached – missed opportunity	the satisfied	Hospital Outpatient Clinic	male	> 70
P5	the correctly unreached	the satisfied	the needy – the prototype	Hospital Outpatient Clinic	female	> 70
P6	the needy – the prototype	the needy – the prototype	the needy – the prototype	Hospital Outpatient Clinic	male	< 60
P7	the falsely unreached – missed opportunity	the satisfied	the satisfied	Private Practice	female	60–70
P8	the needy – the prototype	the needy – the prototype	the needy – the prototype	Hospital Outpatient Clinic	female	60–70
*P9**	the correctly unreached			*Medical Care Centre*	*male*	*> 70*
P10	the needy – the prototype	the needy – the prototype	the needy – the prototype	Hospital Outpatient Clinic	female	< 60
*P11**	the correctly unreached			*Hospital Outpatient Clinic*	*male*	*60–70*
P12	the correctly unreached	the correctly unreached	the correctly unreached	Private Practice	female	> 70
*P13**		the falsely unreached – missed opportunity		*Hospital Outpatient Clinic*	*male*	*60–70*
*P14**		the correctly unreached		*Medical Care Centre*	*female*	*> 70*
*P15**		the correctly unreached	the falsely unreached – missed opportunity	*Medical Care Centre*	*female*	*60–70*
*P16**			the falsely unreached – missed opportunity	*Medical Care Centre*	*male*	*> 70*

italics and * = not interviewed at all three time points
Type 1 = the needy – the prototype; Type 2 = the satisfied; Type 3 = the correctly unreached; Type 4 = the falsely unreached – missed opportunity
T2/T4/T6 = approximately 6, 12 and 18 months after each patient's enrolment

Figure 2

Longitudinal type assignments and sample characteristics across interview time points

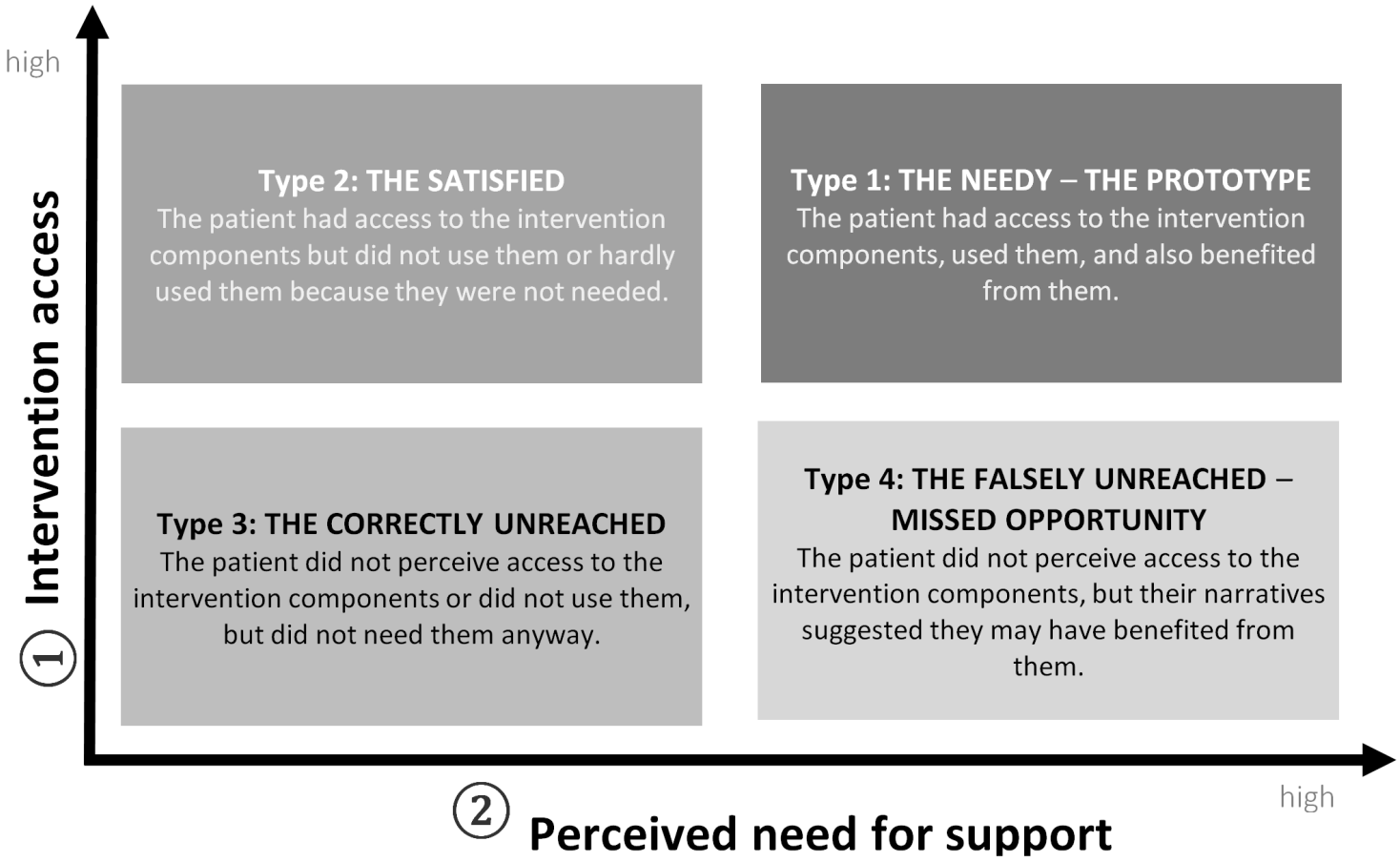


Figure 3

Two-dimensional matrix of the four types

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile1OnCoPaThpatientinterviewguides.docx
- Additionalfile2CodebookevaluativeQCA2ndstep.xlsx
- Additionalfile3Authorcharacteristicsandreflexivity.docx
- Additionalfile4COREQChecklist.docx
- Additionalfile5SRQRchecklist.docx