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Development and pilot of a nurse-led interprofessional case discussion (InCaD) on a nurse-led unit in Germany: an observational cross-sectional study

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Development and pilot of a nurse-led interprofessional case discussion (InCaD) on a nurse-led unit in Germany: an observational cross-sectional study

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Abstract

Background: Structured formats for interprofessional communication and shared decision-making are fostering positive effects communication, collaboration, and patient-related outcomes in clinical practice. Previous studies show considerable heterogeneity in format, structure, and implementation with a lack of nurse-led case discussion models. A nurse-led interprofessional case discussion (InCaD) was developed and piloted on a nurse-led unit (NLU) in a German maximum-care hospital. This study describes the implementation process, explores participating professionals' expectations before first their participation, and evaluates their experiences across repeated sessions.

Methods: In an observational cross-sectional design, data were collected over seven months before and after six InCaD-sessions, using standardized questionnaires. Pre-session questionnaires assessed sociodemographic characteristics, prior experiences, and expectations. Post-session questionnaires assessed session characteristics and ratings of structure, usefulness, interprofessional exchange, and shared decision-making. Data were analyzed descriptively in Excel and R.

Results: 14 pre-session and 28 post-session questionnaires were included. Participants were nurses (N = 17), physicians (N = 2), care and case management (N = 3), and others (N = 6). Mean age was 39.28 years, most participants were female and worked full-time, and mean professional experience was 13.62 years. Expectations before first participation were consistently positive. All respondents expected to express opinion, thoughts, and feelings freely, clarify relevant questions and concerns, improve interprofessional collaboration, and improve discharge planning (each 14/14; 100%). Expectations were lower for competence gain (9/14; 64.3%) and for others' perspectives changing one's own assessment (12/14; 85.7%). Post-participation evaluations were likewise predominantly positive. All respondents agreed

that sufficient information had been provided, main problems had been identified, care goals had been defined, shared decisions had occurred, InCaD was helpful, and interprofessional exchange took place on equal footing (each 28/28; 100%). Lower agreement was reported for timely invitation (19/28; 67.9%), consideration of patients' or relatives' wishes and needs (24/28; 85.7%), and planning security for relatives or caregivers (21/28; 75.0%).

Conclusion: InCaD demonstrated feasibility, contextual appropriateness, and high acceptance. The findings suggest to support structured coordination, shared decision-making, and care planning in complex care situations and provide an empirical basis for further refinement, sustained implementation, and theory-informed evaluation of InCaD as a nurse-led intervention in hospital care.

Key Words: Interprofessional case discussion; nurse-led care; shared decision-making; acute hospital care; implementation study

Contribution to the literature:

- This study provides one of the first empirical descriptions of the implementation and pilot evaluation of a nurse-led interprofessional case discussion (InCaD) in acute hospital care.
- It extends existing literature on interprofessional case discussions by examining not only post-participation experiences, but also participants' expectations prior to first participation and their evaluations across repeated sessions.
- The findings highlight that a nurse-led format can be implemented in routine practice, with particular strengths in case clarification, interprofessional collaboration, and shared decision-making, while also identifying organizational and family-related aspects as relevant targets for further refinement.

Background

Demographic change, increasing life expectancy, and an associated rise in chronic diseases are contributing to growing complexity in acute inpatient care [1-3]. At the same time, medical advances, digital technologies, and new therapeutic options offer extensive treatment opportunities for patients with highly complex, multimorbid, and unstable disease trajectories, thereby placing greater demands on medical and ethical decision-making processes [4, 5]. The challenge of managing complex care situations is intensified by limited human and material resources, workforce shortages, and high workloads, all of which may adversely affect both quality of care and (psychological) well-being of healthcare professionals involved [5-9]. Particularly in acute hospital settings, close interprofessional collaboration is required to ensure continuity of care, patient safety, and needs-based, patient-centered care despite the outlined challenges [10-12].

Structured formats for interprofessional communication and shared decision-making (SDM) are fostering positive effects, including improved communication and collaboration within the healthcare team as well as benefits for patients such as higher satisfaction, better care quality, and more coordinated care processes in clinical practice [13-16]. One possible approach to structural and processual support of SDM and communication in clinical practice are interprofessional case discussions [17, 18]. They provide a framework enabling a systematic alignment of different professional perspectives, the development of a shared interpretation of the situation, and coordinated decisions for care continuity. Particularly in caring for patients with complex nursing and support needs, such discussions help with consolidating relevant information, clarifying responsibilities, and making care planning more transparent, consistent, and patient-centered [19]. Interprofessional case discussions are not standardized

single-component measures but context-dependent complex interventions whose specific design and potential effects depend substantially on how they are adapted to existing routines, professional roles, communication pathways, and organizational conditions [17, 20, 21].

A previous systematic review [17] involving nurses in adult acute hospital care highlighted the heterogeneity in formats of interprofessional case discussions, including interprofessional bedside rounds (I(B)Rs) [22], interdisciplinary rounds (IDRs) [15], structured interdisciplinary bedside rounds (SI(B)Rs) [23], moral case deliberations (MCDs) [24], and multidisciplinary team meetings (MDTMs) [25]. However, an established design and implementation standard is lacking. Core contents of published interprofessional discussion formats include SDM, care coordination, ethical reflection, and the integration of patient and family perspectives. At the same time, considerable heterogeneity with regard to target groups, structures, processes, theoretical foundations, and reported outcomes can be observed [17]. Nurses are frequently involved in interprofessional case discussions and assume active roles in information exchange, care coordination, and ethical reflection. However, given the central role of nurses in complex inpatient care, their potential contribution to moderating interprofessional case discussions appears particularly relevant, but has thus far been only rarely described. These findings highlight a need for clearer conceptual frameworks for interprofessional case discussions as a nurse-led approach, and structured implementation strategies for clinical practice [17].

Building on these findings, an initial programme theory for a concept of an interprofessional case discussion (InCaD) in acute hospital care was proposed [19] and utilized to develop an InCaD implementation and conduction concept [26]. This concept defines InCaD as a structured, recurring, and nurse-led interprofessional case discussion aiming at joint reflection, care planning, and decision-making in routine clinical practice. It´s intend to structure complex care situations at an early stage in a patient-centered manner, strengthen

interprofessional coordination, and systematically integrate nursing, medical, therapeutic, psychosocial, and patient perspectives into care delivery [26].

As the development of InCaD has so far been primarily based on theoretical and conceptual groundwork, a key next step is to transfer the developed model into clinical practice. Following the MRC framework for complex interventions [27, 28], prior to broader evaluation, the InCaD intervention should first be examined with regard to its feasibility, contextual fit, and practical applicability in order to identify uncertainties in the intervention design and generate a robust basis for further research [28]. Accordingly, the primary focus is not on estimating effect sizes, but on the theory-informed development of the InCaD intervention, its adaptation to the specific care context, and its initial practical piloting in routine clinical practice [28].

Given the limited evidence on how a nurse-led InCaD can be tailored to acute inpatient settings, integrated into routine clinical practice, and tested in a pilot phase, further research is needed on the implementation process, participants' initial expectations prior to first participation, and their evaluations across repeated sessions. Additional interest lies in identifying barriers and facilitators during implementation as well as perceived changes at the level of patients, relatives, and the interprofessional team. Against this background, this study aims to describe the implementation and piloting of InCaD in a nurse-led unit (NLU) within a German maximum-care hospital. The following research questions are addressed:

RQ1: What expectations do participants hold prior to their first participation in InCaD?

RQ2: How do participants evaluate InCaD across repeated sessions?

RQ3: What perceived changes are reported regarding patients, families, friends, and their caregivers?

RQ4: What perceived changes are reported within the interprofessional team?

The focus is on a narrative and descriptive presentation of the implementation process of the newly developed InCaD concept, expectations of participants prior to their first participation, repeated InCaD-based evaluations as well as perceived changes at the level of patients, families, and the interprofessional team are explored.

Methods

This observational cross-sectional study is part of a mixed-method development process of InCaD [29], including a systematic review, focus groups and a programme theory which are published elsewhere [17, 19]. The methodological steps of the development and implementation (see Fig. 1) are summarized below. Reporting is guided by the STROBE statement [30] for the observational quantitative components.

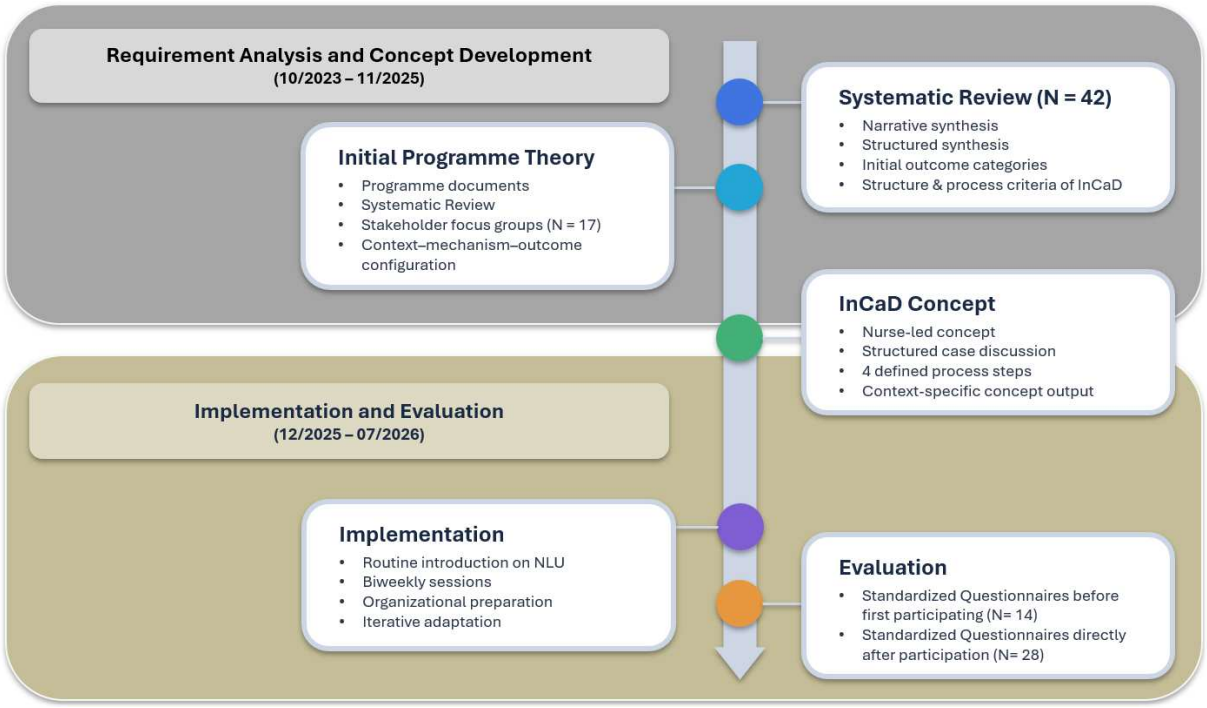


Figure 1: Overview on study process, types of data collection and analysis.

Prior work: from heterogeneity in case discussions to the InCaD

The InCaD concept was developed through an iterative and theory-informed process based on findings from a systematic review on interprofessional case discussions involving nurses in adult acute hospital care [17], an initial programme theory [19] developed using a realist methodology [31, 32], and the contextual requirements of the NLU in which the implementation was conducted. Based on these empirical and theoretical foundations, InCaD was adapted to organizational and clinical requirements and translated into a structured intervention concept. This concept was operationalized through a corresponding implementation manual that specified the preparation, introduction, pilot application, and evaluation of InCaD in routine practice. For more information see the implementation manual (see Additional file 1).

The InCaD intervention

InCaD is a structured, nurse-led format for joint reflection, care planning, and decision-making in routine clinical practice. It brings together interprofessional teams in regular moderated case discussions to analyze complex care situations in a patient-centered way, define shared goals, and coordinate care actions. The format aims to structure care situations early, before uncertainty or conflicts in decision-making arise [26]. Conceptually, InCaD is a participatory, patient-centered decision-making process that integrates nursing, medical, therapeutic, and psychosocial perspectives, and (where possible) those of patients and relatives. It draws on principles of shared decision-making and anticipatory care planning to support transparent, value-based, and needs-oriented care decisions [26]. InCaD is organized and moderated by trained nurses, who coordinate preparation, facilitation, and follow-up. This nurse-led approach leverages nurses' continuous patient proximity and holistic view of care processes

to support structured interprofessional decision-making while maintaining its collaborative character [26].

InCaD process and organization

InCaD follows a recurring and defined process (see Fig. 2). Suitable patients are identified according to predefined criteria, for example in cases of complex nursing and support needs, challenging discharge situations, high symptom burden, or ethical and moral issues. The actual case discussion comprises four consecutive steps: (1) Providing information, (2) identification of key problems, (3) developing action strategies, and (4) deciding and planning measures [26].

Organizationally, InCaD is structured as a regular, recurring meeting held every two weeks. Sessions last up to 60 minutes and typically address three to four patient cases. Discussions should ideally be held in a quiet, neutral, and easily accessible room. Participation is intended for all professional groups relevant to the respective care situation. In addition to nurses and physicians, this may include therapists, social workers, care and case managers, and other professionals depending on the specific case (Table 1). InCaD is thus explicitly designed as an interprofessional format with a clear nurse-led moderation that systematically integrates diverse perspectives. The InCaD process is documented in a protocol with all participants receiving a copy of the protocol afterwards. Further a follow up with communicating the results, implementing the agreed measures within the interprofessional team and, conducting regular re-evaluations to ensure that care meets patients' needs is planned [26].

InCaD patient selection criteria

Patients are selected based on predefined criteria (Table 1), including a hospital stay of at least five days, complex nursing, medical, and therapeutic needs, and challenging discharge or aftercare planning. Additional inclusion criteria comprise ethical or moral dilemmas, complex

decision-making situations, and unresolved or recurring case-related challenges. A clear decision-making basis is required to guide patient inclusion in InCaD.

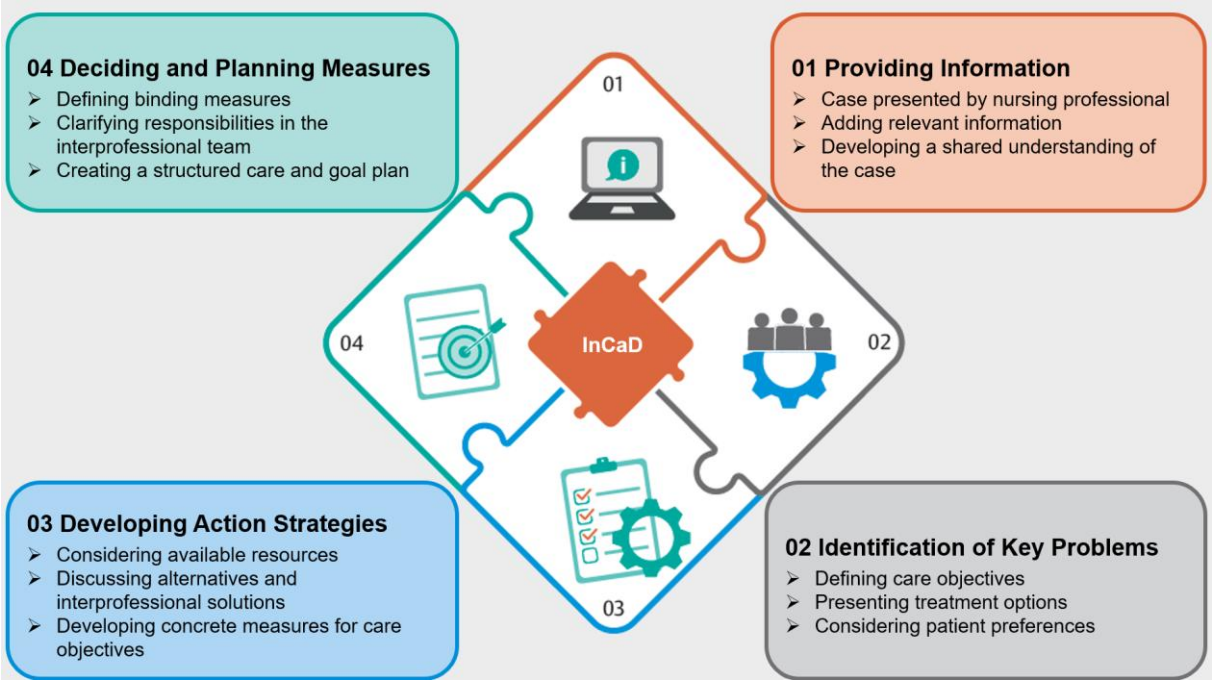


Figure 2: Procedure for the InCaD [26]

Patient selection criteria	• Admitted to the ward for at least 5 days • Complex nursing, medical and therapeutic needs • Complex discharge and aftercare planning • Ethical and moral issues, dilemmas and decision-making • Unresolved InCaD case or recurring challenges ➔ For patient selection, a basis must be defined upon which the decision to include patients in the InCaD is made
Participants	• Nursing professionals with university qualifications • Nursing professionals without university qualifications • Nursing experts (e.g., wound managers, uro therapists , pain nurses, stoma therapists) • Nursing assistants and support staff • Nursing scientists • Physicians • Care and Case Manager • Others
Frequency	Every 2 weeks
Duration	Up to 60 minutes
Location	Neutral room, either on the ward or in the immediate vicinity
Moderation	The moderation comprises several phases: (1) *Welcome and Opening, (2) Clarification of the occasion and the question, (3) Gathering of facts, (4) Assessment of the facts, (5) Result and recommendation, (6) Farewell and follow-up*
Organizational Framework	• **Organizational preparation:** Gathering all necessary documents as complete nursing documentation, records from previous InCaD, and completed assessments. Each participating professional or specialist group is responsible for compiling its own documentation. • **Invitation to InCaD:** Moderating nurse invites participants. Generally, two invitation letters are provided for this purpose, which can be sent by email: 1. Invitation of all participating professional or specialist groups 2. Invitation of families, relatives and caregivers The invitation will be sent a reasonable amount of time before the InCaD. • **Documentation of InCaD:** The InCaD process is documented in a protocol. All participants receive a copy of the protocol afterward. • **Consideration of InCaD in patient documentation:** Participation, whether in person or not, is documented in the patient's file.
Follow-up	• Communicating the results • Implementing the agreed measures within the interprofessional team • Conducting regular re-evaluations to ensure that care meets patients' needs

Table 1: Key Facts InCaD

Study setting and InCaD implementation process

For this implementation study a NLU was chosen as implementation setting. NLUs are characterized by patients with complex care needs, high nursing care demands, and a strong requirement for interprofessional coordination, they represent a particularly relevant setting for the introduction of InCaD. In these NLUs, nurses take substantial responsibility for care planning and coordination, while physicians and other professionals contribute within a collaborative team structure, making the setting especially suitable for piloting a nurse-led model of interprofessional case discussions [33, 34].

The study NLU comprises 13 beds, with six to ten beds being operational due to staff shortages during the pilot phase. Patient documentation is fully electronic. The NLU is embedded in a municipally run German maximum-care hospital with 833 beds, annually providing care for around 27,000 inpatients, 3,700 day-case patients, 40,000 outpatients, and 46,000 emergency cases. The NLU head nurse (RG), the NLU nursing scientist (KS), and two NLU nurses accompanied the InCaD implementation, which followed a structured pilot phase based on an InCaD implementation manual. Before the start of the biweekly InCaD sessions, the InCaD concept was introduced to and shared with relevant professional groups (e.g., nurses, therapists, and case and care management) in a 60-minute kick-off workshop. Moderated by the first author (JP), the workshop focused on three guiding questions regarding suitable patients, prerequisites for successful implementation, and interprofessional communication and decision-making. Findings were documented on Metaplan cards, photographed, and thematically summarized.

InCaD sessions were planned for up to 60 minutes and could typically cover three to four patient cases per meeting. Patients and relatives were actively involved whenever possible.

Before their first participation, participants completed a questionnaire assessing baseline characteristics, prior experiences with case discussions, and expectations regarding InCaD. The implementation was accompanied by continuous documentation and repeated post-session questionnaire-based evaluations. A concluding workshop reflected on the implementation process and identified further support and adaptation needs. This analysis includes only data from the first participation and the immediate post-session evaluation questionnaires.

Questionnaire development and data collection

Data were collected from January 2026 to July 2026 using standardized questionnaires before first participation in InCaD and after each of the six InCaD sessions conducted. Both questionnaires were distributed and collected by the nurse moderating the respective InCaD. Both questionnaires (see Additional file 2) were developed for this study using a combined deductive-inductive approach. Core domains were derived from theory and the literature [17, 35], while additional items and context-specific adaptations were developed on the basis of focus groups and project-related discussion rounds.

The pre-questionnaire comprised one section on sociodemographic and professional characteristics, including age, professional experience, professional qualification, gender, employment extent, and duration of employment at the study hospital. In addition, the questionnaire contained one section on expectations regarding InCaD on the NLU, consisting of 13 items, and a further section with one item on prior experience with interprofessional case discussions. The Post-session questionnaires captured both session characteristics and participants' evaluations of structure, usefulness, interprofessional exchange, and SDM. It initially contained one section with general information on the InCaD, including date, location, duration, the patient cases discussed, and whether patients or relatives were present. A

further section assessed sociodemographic and professional characteristics and corresponded in content to the pre-questionnaire supplemented by one item on participation in the InCaD. In addition, one item assessed how often participants had previously taken part actively in an InCaD. This was followed by a 22-item section on participants' experience of the respective InCaD and a final section on the evaluation of the InCaD comprising eight items. Across all questionnaires the sections on expectations, experiences, and evaluation, item coding was kept consistent using the same five-point Likert scale (1 = agree, 2 = rather agree, 3 = rather disagree, 4 = disagree; 5 = no answer). To enhance content clarity and feasibility, both questionnaires underwent pilot testing with nursing scientists prior to data collection. Feedback from this pilot phase was used to refine wording and improve the practical applicability of the instruments.

Participants and sampling

In a consecutive convenience sampling approach [36], all participants received written and oral information on the study by the accompanying NLU team and were consecutively invited to complete the study questionnaires either immediately after InCaD or within the following work days. Participants were hospital professionals involved in the implementation and conduct of InCaD as well as actively treating and caring for patients on the NLU. All professional groups, including nurses, physicians, therapists, and other professionals depending on the individual patient case as well as patients themselves and their families or external service provides and legal guardians were eligible to participate if they were able to answer the German language questionnaire. Due to the exploratory nature of the study, no sample or effect size calculations were conducted.

Data preparation and analysis

Data preparation and analysis were conducted using Microsoft Excel and R statistical software. Only questionnaires that could be clearly attributed to a distinct participant status (e.g., nurse, relative) were included in the analysis. The questionnaires comprised metric, nominal, ordinal, and Likert-type variables. Sociodemographic, professional, and session-related characteristics were analyzed according to their scale level using descriptive statistics. Expectations, experiences, and evaluations were assessed using five-point Likert-type items and analyzed descriptively at item and dimension level. For nominal variables (e.g., professional group, gender, main workplace, type of participation in InCaD), absolute and relative frequencies were calculated. For ordinal variables, particularly the Likert-scaled expectation, experience, and evaluation items, frequencies and percentages for each response category were calculated to describe response patterns at both item and dimension level. For metric variables (e.g., age and years of professional experience), means, standard deviations, medians, and ranges were reported. For descriptive analysis, Likert-scaled items were reverse-coded to ensure a consistent direction of interpretation across questionnaires and dimensions, with higher values indicating more positive expectations, experiences, or evaluations and 5 representing the most favorable response option. Both questionnaires were pilot tested with nursing scientists prior to their use in order to assess comprehensibility, content fit, and practical applicability [37]. Feedback from this pilot testing informed minor linguistic and contextual revisions of the instruments. Questionnaire development followed a combined deductive-inductive approach: core domains were derived from theory and the literature, while additional items and context-specific adaptations were developed on the basis of focus groups and project-related discussion rounds. One questionnaire with missing data in more than three fields was excluded from analysis (N=1). Questionnaires with up to three missing values were

retained and analyzed for all available variables. Missing values were not imputed but were handled descriptively at variable level.

For the comparative presentation of expectations prior to first participation and immediate post-participation evaluations, conceptually overlapping items from both questionnaires were grouped into harmonized comparison dimensions [38]. These comprised person-related impact, interprofessional collaboration, efficiency and feasibility, and care-related outcome. Additional dimensions assessed only in the post-participation questionnaire were analyzed separately as post-participation-specific implementation dimensions.

Ethical considerations

The study received ethical approval from the ethics committee of the German Society of Nursing Science (application no. 24-007). Participation was voluntary. Participants were informed about the study aims and data protection procedures prior to participation. Questionnaire return was treated as informed consent, and all data were handled confidentially in accordance with applicable data protection regulations, stored on password-protected institutional servers, and accessed only by authorized members of the research team.

Results

A total of six InCaD with eight patient cases occurred. Patient cases (Table 2) represent a heterogeneous spectrum of complex care needs with internal medicine, trauma surgery, and general surgery being the most frequent medical disciplines responsible. InCaD topics predominantly address discharge planning, continuation of care, legal guardianship,

prevention of readmission, wound-related follow-up care, and the organization of aftercare in situations of limited home support.

Mean age of InCaD participants (Table 3) is 39,28 years (SD: 13,40 years) and most are female and work fulltime. Mean professional experience is 13,62 years (SD: 10,6 years). Nurses with a three-year professional qualification participated most frequently, followed by academically qualified nurses and other involved professional groups, including care and case management, medicine, and further discipline-specific roles. Participants worked either exclusively on the NLU or in a combination of the NLU and other areas, indicating that the InCaD involved both ward-based and interface-related professionals. With regard to active participation in the sessions, information sharing and the proposal of interventions are more common than passive attendance (Table 3).

Table 2: Sociodemographic characteristics of participants in InCaD

Characteristic	N	%
Total	28	100
Age, years, mean (SD)	24-64y; 39,28y (13,40y)	
Sex		
Women	25	89
Men	3	11
Professional Experience		
Years, mean (SD)	1-42y; 13,62y (10,6y)	
Status group		
Nurse, 3-year qualification	12	42,86
Nurse, academically qualified (B.A./B.Sc./M.A./M.Sc./Management)	5	17,86
Nursing assistant	0	0
Medicine	2	7,14
Physiotherapy	0	0
Care & Case Management	3	10,71
Others	6	21,43
Main workplace		
Only on the NLU	12	42,86
NLU & other areas	3	10,71
Only in other areas	13	46,43
Employment extent		
25%	1	3,57

Characteristic	N	%
50%	1	3,57
75%	5	17,86
100%	21	75
Type of participation in InCaD		
Only listened	5	11,11
Brought information	10	22,22
Shared information	17	37,78
Suggested interventions	13	28,89

1

Table 3: Characteristics of patients discussed in InCaD (N=8).

InCad case number	Age (years)	Sex	Main Diagnosis (ICD-10-GM)	Comorbidities (ICD-10_GN)	Medical department	InCaD Topic
1_1	60	male	**Pneumonia**	Multidrug-resistant Pseudomonas aeruginosa (4MRGN), presence of other artificial openings in the gastrointestinal tract, diabetes mellitus, monitoring of dressings and sutures, moderate depressive episode, dysphagia requiring supervision during meals	Internal Medicine	Possibility of being discharged home
2_1	56	female	**Sepsis**	Non-nosocomial sepsis, thrombosis, social interactions, complications arising from medicines or drugs, depressive episodes, hemiparesis and hemiplegia, urinary tract infection	Internal Medicine	Option for final disposition while the guardianship proceedings are ongoing
3_1	89	female	**Fracture of the femoral shaft**	Delirium in dementia, faecal incontinence, urinary incontinence, dementia, isolation as a preventive measure, pressure ulcers	Trauma surgery	Procedure following the appointment of a legal guardian
3_2	60	male	**Stomach injury**	Nausea and vomiting, alcohol-induced polyneuropathy, isolation as a preventive measure, hypokalaemia, moderate depressive episode	General Surgery	Avoiding readmission due to inadequate home care
4_1	86	male	**Superficial injury to other parts of the head**	Delirium, restlessness and agitation, irritability and anger Risk of falls, difficulties relating to the need for care, essential (primary) hypertension, atrial fibrillation, hypokalaemia	Trauma surgery	Legally required care and follow-up care
4_2	66	male	**Necrotising fasciitis**	Disorientation	Trauma surgery	Replenishment with wound care providers
5_1	89	female	**Fracture of the femoral shaft**	Delirium in dementia, faecal incontinence, urinary incontinence, isolation	Trauma surgery	Procedure following the appointment of a legal guardian
6_1	84	male	**Volume depletion (fluid deficit)**	Dizziness, dementia	Internal Medicine, Nephrology	Follow-up care involving a move from one's own home to residential long-term care

Expectations prior to first participation in InCaD

Before first InCaD participation, 14 healthcare professionals completed the questionnaire. Overall, expectations towards InCaD are consistently positive with little variation across items (see Fig. 3). Agreement percentages refer to the two most positive response categories (agree and somewhat agree). All participants expected that they would be able to express their opinion, thoughts, and feelings freely (14/14; 100%) and clarify relevant questions and concerns (14/14; 100%). Expectations regarding competence gain through participation were lower, although still positive overall (9/14; 64.3%). Participants also reported very positive expectations that collaboration with other professional groups would improve (14/14; 100%) and that the perspectives of other participants would change their own assessment of the situation (12/14; 85.7%).

With regard to expected process-related effects, 85.7% (12/14) expected that workflows within the team would become more efficient, while 78.6% (11/14) expected an improvement in their own job satisfaction. Similarly, 85.7% (12/14) expected that work processes within the team would become more efficient. Expectations regarding care-related effects were also consistently positive. Participants expected improvements in the quality of care (13/14; 92.9%), greater efficiency of patient care (85.7%), and the occurrence of shared decisions (13/14; 92.9%). Likewise, 92.9% (13/14) expected that patient satisfaction would improve, and all participants expected an improvement in discharge planning (14/14; 100%).

Taken together, the pre-session findings indicate that participants approached InCaD with high expectations particularly regarding interprofessional collaboration, SDM, and improvements in care-related processes, whereas expectations regarding individual professional development and job satisfaction were somewhat less pronounced.

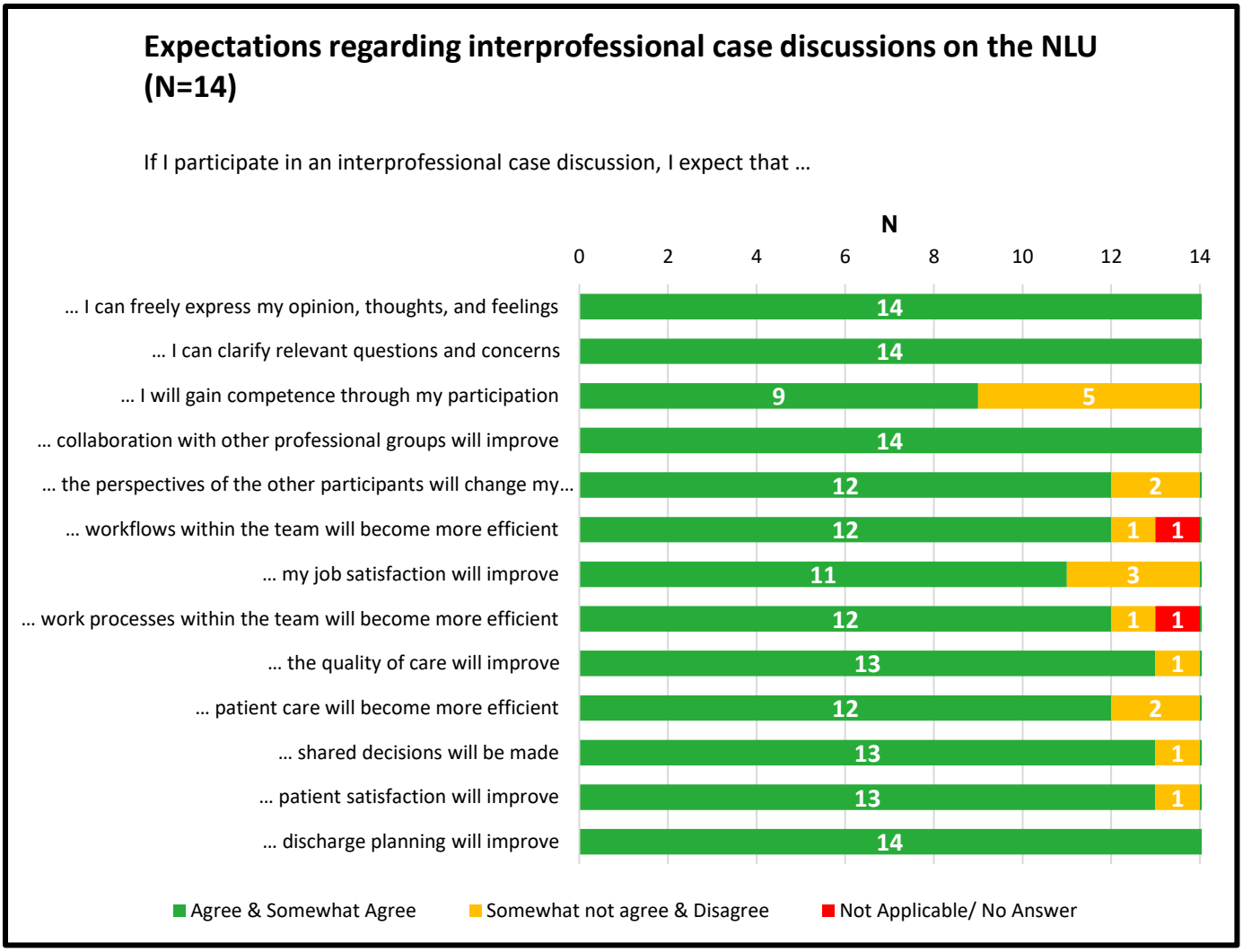


Figure 3: Expectations prior to first participation in InCaD (N=14)

Post-participation experiences of InCaD

All 28 professional participants reported consistently positive experiences in the post-session questionnaires (see Fig. 4). InCaD was rated as helpful (28/28; 100%), with high agreement for the feasibility of InCaD in everyday practice (27/28; 96.4%) and the statement that the benefit for patients justified the effort (27/28; 96.4%). The benefit for the care team was rated even more positively (28/28; 100%). Ratings for the location (26/28; 92.9%) and duration of InCaD (28/28; 100%) were likewise favorable. In contrast, the item on timely invitation showed the lowest agreement within this block (19/28; 67.9%). All participants agreed that suitable patient cases had been discussed (28/28; 100%), while most also expected that the discussed

measures would be feasible to implement (25/28; 89.3%). All respondents confirmed that a nurse had led the InCaD (100%), and that InCaD had followed a clear process (27/28; 96.4%) with sufficient information having been provided (28/28; 100%). Likewise, all participants (28/28, 100%) reported that a shared understanding of the case had been developed100%, that main problems had been identified (28/28; 100%), and that care goals had been defined (28/28; 100%). The development of action strategies was rated very positively for both corresponding items (28/28; 100%). Similarly, participants agreed that patients' resources had been considered (28/28; 100%) and that shared decisions had been made (28/28; 100%). Measures to improve the care situation were also positively evaluated (27/28; 96.4%). Comparatively lower ratings were found for the consideration of patients' or relatives' wishes and needs (24/28; 85.7%) and for the development of structured care and treatment plans (26/28; 92.9%).



Figure 4: Post-participation experiences of InCaD (N=28)

Post-participation rating of the InCaD

Experience ratings of InCaD were also predominantly positive (see Fig. 5). Most participants reported that they had been able to express their opinions, thoughts, and feelings freely (27/28; 96.4%). The possibility to clarify relevant questions and concerns was also rated positively (25/28; 89.3%), as was competence gain through participation (24/28; 85.7%). The moderation was perceived as clearly structured and goal-directed by most respondents (25/28; 89.3%). Strong agreement was found for the clarification of responsibilities within the interprofessional team (28/28; 100.0). Ratings were lower for the creation of planning security for relatives and caregivers (21/28; 75%) and for improved job satisfaction (22/28; 78.6%). By contrast, interprofessional exchange on equal footing was rated very positively by all respondents (28/28; 100%).

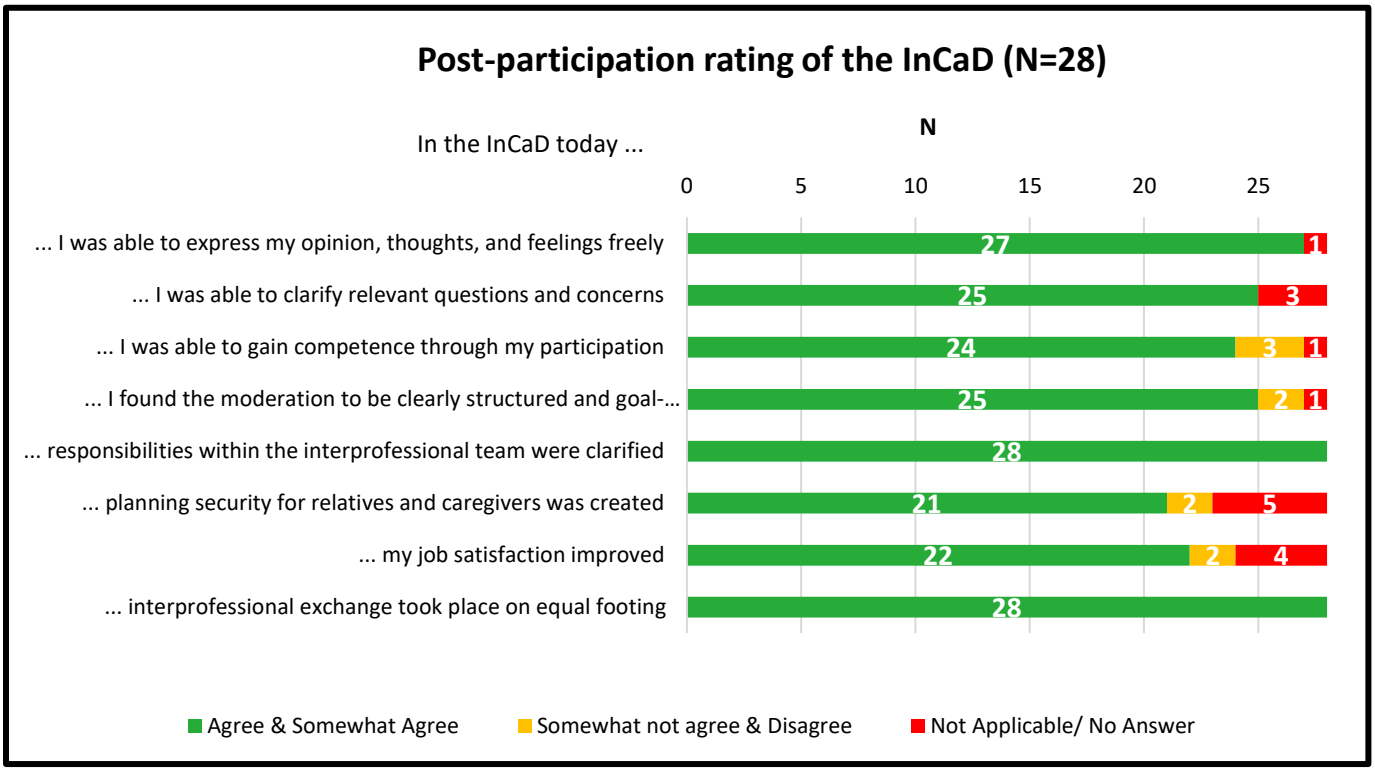


Figure 1: Post-participation rating of InCaD (N=28)

Harmonized dimensions across pre- and post-participation questionnaires

To enable a structured comparison between expectations before first participation and immediate evaluations after participation, conceptually overlapping items from the pre-participation and post-participation questionnaires were grouped into harmonized dimensions: person-related impact, interprofessional collaboration, efficiency and feasibility, and care-related outcome (Table 4). Because the two questionnaires were not fully item-identical and no person-level linkage between pre- and post-participation responses was conducted, the following findings represent a descriptive comparison of conceptually related dimensions.

Table 4: Harmonized dimensions across pre- and post-participation questionnaires

Dimension	Pre-participation item	Pre-participation agreement (N=14) N (%)	Post-participation item	Post-participation agreement (N=28) N (%))
Person-related impact	E1. Free expression of opinion, thoughts, and feelings expected	14 (100)	E1. Able to express opinion, thoughts, and feelings freely	27 (96.4)
	E2. Clarifying relevant questions and concerns expected	14 (100)	E2. Able to clarify relevant questions and concerns	25 (89.3)
	E3. Competence gain expected	9 (64.3)	E3. Gained competence through participation	24 (85.7)
Interprofessional collaboration	E4. Improved collaboration with other professional groups expected	14 (100)	D13. Shared understanding of the case developed	28 (100)
	E5. Others' perspectives change one's own assessment expected	12 (85.7)	E5. Responsibilities within the interprofessional team were clarified	28 (100)
	E11. Shared decisions expected	13 (92.9)	D18. Shared decisions were made	28 (100)
			E8. Interprofessional exchange took place on equal footing	28 (100)
Efficiency and feasibility	E6. More efficient workflows expected	12 (85.7)	D2. InCaD was feasible in everyday practice	27 (96.4)
	E8. More efficient work processes expected	12 (85.7)	D9. Discussed measures will be feasible to implement	25 (89.3)
	E10. More efficient patient care expected	12 (85.7)	D11. InCaD followed a clear process	27 (96.4)
Care-related outcome	E9. Improved care quality expected	13 (92.9)	D15. Care goals were defined	28 (100)
	E12. Improved patient satisfaction expected	13 (92.9)	D16. Strategies for action were developed	28 (100)
	E13. Improved discharge planning expected	14 (100)	D20. Measures to improve the care situation were planned	27 (96.4)

Dimension	Pre-participation item	Pre-participation agreement (N=14) N (%)	Post-participation item	Post-participation agreement (N=28) N (%))
			D22. Structured care and treatment plans were developed	26 (92.9)
Agree (%) combines the response categories 1 = agree and 2 = somewhat agree. E = expectation pre-participation questionnaire item/ post-participation rating item; D = post-participation experience item; N = number of participants				

The clearest convergence was observed for person-related impact and interprofessional collaboration. Before first participation, all respondents expected that they would be able to express their views freely and clarify relevant questions and concerns (14/14; 100.0% each). After participation, these proportions remained high at 27/28 (96.4%) and 25/28 (89.3%), respectively. Competence gain showed the most notable descriptive increase, from 9/14 respondents (64.3%) before participation to 24/28 (85.7%) after participation. Likewise, collaboration-related expectations were mirrored by uniformly positive post-participation ratings for shared case understanding, clarified responsibilities, shared decisions, and interprofessional exchange on equal footing (28/28; 100.0% each). Efficiency and feasibility as well as care-related outcome also showed a predominantly positive pattern, although these dimensions should be interpreted more cautiously because the pre- and post-participation items were only partially conceptually overlapping. Before participation, 12/14 respondents (85.7%) expected improvements in workflows, work processes, and patient care. After participation, 27/28 respondents (96.4%) rated the InCaD as feasible in everyday practice and agreed that it followed a clear process, while 25/28 (89.3%) agreed that the discussed measures would be feasible to implement. In the care-related dimension, 13/14 respondents (92.9%) expected improvements in care quality and patient satisfaction, and all respondents expected improved discharge planning (14/14; 100.0%). After participation, all respondents reported defined care goals and developed action strategies (28/28; 100.0% each), while 27/28 (96.4%) agreed that measures to improve the care situation had been planned. Taken together, the harmonized dimensions suggest that the InCaD not only met participants' initial

expectations but, in some areas, descriptively exceeded them, particularly with regard to competence-related benefit and interprofessional collaboration and decision-making.

Post-participation specific implementation dimensions

In addition to the harmonized dimensions, implementation-relevant dimensions were assessed in the post-participation questionnaire (Table 5). Implementation dimensions comprised usefulness, organization, case clarification, patient/family orientation, and nurse-led moderation of InCaD.

Table 5: Post-participation rating of implementation dimensions

Dimension	Item	Post-participation agreement (N=28) N (%)
Usefulness	D1. InCaD was helpful	28 (100)
	D3. Benefit for patients justified the effort	27 (96.4)
	D4. Benefit for the care team justified the effort	28 (100)
Organization	D5. Location was appropriate	26 (92.9)
	D6. Duration was sufficient	28 (100)
	D7. Invited early enough	19 (67.9)
	D8. Suitable patient cases were discussed	28 (100)
Case clarification	D12. Sufficient information was provided	28 (100)
	D14. Main problems were identified	28 (100)
Patient/family orientation	D17. Patients' resources were considered	28 (100)
	D21. Wishes and needs of patients/relatives were considered	24 (85.7)
	E6. Planning security for relatives/caregivers was created	21 (75)
Nurse-led moderation	D10. A nurse led the InCaD	28 (100)
	E4. Moderation was clearly structured and goal-directed	25 (89.3)

Agree (%) combines the response categories 1 = agree and 2 = somewhat agree. E = post-participation rating item; D = post-participation experience item; N = number of participants

Usefulness was rated particularly favorably: all participants agreed that the InCaD was helpful (28/28; 100.0%) and that the benefit for the care team justified the effort (28/28; 100.0%), while 27/28 (96.4%) also considered the effort justified for patients. Organizational aspects were likewise rated positively, although with greater variation. Agreement was highest for

suitable patient cases and sufficient duration (28/28; 100.0% each), and the location was also evaluated positively (26/28; 92.9%). By contrast, timely invitation showed the lowest agreement within this dimension (19/28; 67.9%). Case clarification showed a uniformly positive pattern. All participants agreed that sufficient information had been provided and that the main problems had been identified (28/28; 100.0% each), indicating that the InCaD functioned well as a format for structuring and clarifying complex cases. Patient/family orientation also remained positive overall. Consideration of patients' resources was endorsed by all respondents (28/28; 100.0%), while 24/28 (85.7%) agreed that the wishes and needs of patients or relatives had been considered. Agreement was lower for planning security for relatives and caregivers (21/28; 75.0%). Nurse leadership/moderation showed a very favorable pattern. All participants agreed that the InCaD had been moderated by a nurse (28/28; 100.0%), and 25/28 (89.3%) rated the moderation as clearly structured and goal-directed. Taken together, the post-participation-specific implementation dimensions indicate that the InCaD was experienced as highly useful, with particular strengths in case clarification and nurse-led moderation, whereas organizational and family-related aspects showed somewhat greater variability.

Discussion

The findings of the present study indicate a consistently positive picture of the implementation of InCaD on a NLU. Even before first participation, high expectations were reported, particularly with regard to successful interprofessional collaboration, SDM, and more structured care planning (RQ1). These expectations are largely mirrored in the post-session evaluations. With regard to RQ2, positive ratings were observed for aspects such as nurse-led moderation, the identification of main problems, the development of a shared understanding

of the case, the definition of care goals, and the joint planning of further measures, which constitute the core of InCaD [26]. Perceived changes at the level of patients, relatives, and caregivers were described more cautiously, especially with regard to family- and caregiver-related planning aspects (RQ3). By contrast, the findings suggest that InCaD was perceived as particularly beneficial for the interprofessional team, especially in terms of communication on equal footing, clarification of responsibilities, and collaborative decision-making (RQ4). At the same time, the results suggest that InCaD could be implemented as a structured, nurse-led format within routine practice on the NLU, although some organizational aspects, especially timely invitation, remained more variable.

These findings are closely aligned with the preceding stages of concept development. First, they are consistent with the systematic review [17], which showed that interprofessional case discussions in acute hospital care are primarily described as structures for coordination, SDM, and the integration of different professional perspectives, while at the same time remaining highly heterogeneous in their specific design [17]. Likewise, findings are compatible with the initial programme theory [19], in which a supportive team culture, transparent distribution of roles and tasks, sufficient case-related information, and moderation that enables participation and reflection were identified as key contextual conditions. The fact that precisely these aspects were rated particularly positively in the present study can therefore be understood as an initial empirical plausibilization of the programme-theoretical assumptions, although not as a theory test in the narrower sense [17, 19].

The positive ratings of the harmonized dimensions interprofessional collaboration and efficiency and feasibility suggest that InCaD was perceived not merely as a discussion format, but as a structuring framework in which different professional perspectives could be systematically brought together, responsibilities could be clarified, and decisions could be

prepared cooperatively. This interpretation is consistent with international literature on interprofessional clinical decision-making, which describes the development of a shared understanding of the case, the visibility of professional perspectives, the negotiation of common goals, and the clarification of responsibilities as central elements of such processes [39]. Similarly, other formats such as structured interprofessional (bedside) rounds have shown that interprofessional communication and perceived work efficiency between nursing and medicine can be improved [22]. In this respect, the present findings extend the evidence base by describing an explicitly nurse-led format in a German hospital, highlighting a nurse-led approach to interprofessional case work that has thus far been reported far less frequently [17, 18].

The nurse-led approach represents a distinct contribution of InCaD in comparison to prior work with nurses not only being accepted as a participating professional group, but also as the structuring and moderating instance of InCaD. This is relevant because complex care situations in acute hospital settings often require continuous nursing coordination, the integration of day-to-day clinical observations, and cross-professional alignment [29]. International research emphasizes that nurses play a key role in information integration, coordination, and continuity of care, particularly in the context of nursing coordination for patients with complex care needs [40]. Further studies on interprofessional collaboration show that successful collaboration depends substantially on role clarity, mutual trust, open communication, and structural support [11]. Against this background, a nurse-led format such as InCaD seems to be particularly well suited for settings in which complex nursing care needs, discharge planning, and interprofessional coordination processes are closely intertwined.

The participatory orientation of InCaD also became visible in a differentiated way. High ratings for exchange on equal footing, free expression of one's own assessments, and SDM suggest

that participation was initially realized primarily at the level of the interprofessional team. In this respect, InCaD appears to create a space in which different professional voices do not merely coexist, but are actively translated into a shared care plan. At the same time, more reserved ratings for the central conceptual element of patient and family participation in InCaD suggest that a systematic involvement of patients and relatives was more difficult to realize in the early implementation phase than profession-related participation. This observation is consistent with findings on family-centered rounds and SDM in the context of complex care needs [41]. Positive effects such as satisfaction, information exchange, and team communication in family-centered hospital rounds depend on consistent structural, communicative, and organizational preconditions [41, 42]. Participatory decision-making processes become more demanding in the context of multimorbidity, multiple decisions, and cross-sector care pathways [43, 44]. Against this background, the somewhat weaker family-related findings should not be interpreted as a weakness of the InCaD concept, but rather as an indication of a distinct implementation need.

A greater variability in ratings of organizational aspects is also understandable in substantive terms: Timely invitation to InCaD suggests that the organizational embedding of the format had not yet been fully standardized in the early pilot phase. This is consistent with the broader implementation literature on interprofessional collaboration, according to which, lack of time, unclear responsibilities, missing routines, and communication barriers are among the most common implementation barriers [39, 45]. This draws attention to a central condition for sustainability of InCaD. The quality of the format depends not only on its conceptual design, but also on its organizational framing. Thus, alongside the finding that InCaD is fundamentally suitable, it needs to be assessed under which structural conditions the format can realize its strengths in everyday practice.

Several implications for practice and organization arise from these findings. First, InCaD appears to be viable when moderation, role clarity, and structured case preparation are ensured. Second, organizational preparation should be more strongly standardized. For example, reliable invitation routines, clear criteria for case selection, and an early involvement of relevant professional groups contribute to standardization. Third, a need to create opportunities to integrate the perspectives of patients and relatives more systematically into InCaD arises. Here, preparatory information and coordination processes or implementing feedback steps after InCaD defined in the implementation manual can be of use. Fourth, a need for training and support for moderation persists. In this regard, structured and recurring formats with defined roles can be embedded in organizations when training, feedback, and organizational support are combined [39].

Overall, InCaD was not only met with a high level of approval, but was also perceived as a format of interprofessional action in complex care situations. The study therefore contributes to a more precise understanding of the practical feasibility, perceived usefulness, and context-specific requirements of nurse-led interprofessional case discussions in acute hospital care, making these insights usable for further concept development and sustainability.

In a next step, implementation of InCaD over a longer period of time, with inclusion of additional sessions and further participating professional groups, and in other hospital settings should be evaluated. Of particular interest is whether those aspects rated more variably stabilize over time and can be improved through targeted adaptations. It should also be examined whether positive ratings of case-related work, interprofessional collaboration, moderation, and interprofessional decision-making can be maintained under conditions of sustained routine use. In addition, it appears necessary to systematically incorporate barriers, facilitators, and adaptation processes into further analyses in order to gain a more

differentiated understanding of which contextual conditions are crucial for the sustainable embedding of InCaD in routine clinical practice. Future evaluations should therefore be expanded in order to link the presented findings on acceptability, practicability, and conceptual fit with changes at the level of team processes, discharge planning, and patient-related outcomes.

Strengths and Limitations

As this is an implementation study, its value lies in describing acceptability, practicability, and initial conceptual fit in routine clinical practice while claims about are less of interest. This is consistent with methodological discussions of pilot and feasibility studies, which emphasize on making uncertainties visible in relation to intervention design, contextual embedding, and feasibility of delivery in early phases of complex interventions [28, 46]. A major strength of this study is building on the underlying systematic concept development process and initial programme theory. Further, combining quantitative and qualitative developmental steps allows to include different perspectives on expectations, immediate experiences, and implementation-related aspects.

However, as this is also a single-site study within a specific care context, the transferability of findings to other acute care hospitals, organizational structures, or forms of interprofessional case discussions is limited. Additionally, the small sample size, the early stage of implementation, the predominantly self-reported outcomes, and the absence of patient-related endpoints need to be taken into account. The findings should therefore be interpreted as descriptive and hypothesis-generating rather than as evidence of effectiveness.

Conclusion

In summary, InCaD is not only conceptually plausible but also practically applicable. Healthcare professionals perceive InCaD to be acceptable, practicable, and substantively meaningful for their work, showing its potential wherever complex care situations need to be structured, coordinated across professional boundaries, and translated into shared decisions. Beyond organizing interprofessional communication, InCaD points to a possible benefit for patient care by helping to identify complex needs at an earlier stage, coordinate decision-making processes more transparently, and align care planning more collaboratively and tailored to patients' needs. A basis for further context-sensitive refinement, consolidation, and theory-informed evaluation of the InCaD as a complex nurse-led intervention in hospital care is now available.

Abbreviations

DGP: German Society of Nursing Science

EU-GDPR: European General Data Protection Regulation

GDPR: General Data Protection Regulation

I(B)Rs: Interprofessional bedside rounds

ICD-10-GM: International Statistical Classification of Diseases and Related Health Problems, 10th Revision, German Modification

IDRs: Interdisciplinary rounds

InCaD: Interprofessional case discussion

MCDs: Moral case deliberations

MDTMs: Multidisciplinary team meetings

MRC: Medical Research Council

NLU: Nurse-led unit

RQ: Research question

SDM: Shared decision-making

SI(B)Rs: Structured interdisciplinary bedside rounds

Declarations

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We thank all InCaD participants for their willingness and motivation to actively participate. Thanks to their contributions, we were able not only to find important solutions for the patients discussed but also to generate valuable insights for this study.

Ethics approval and consent to participate

This study was planned and conducted in accordance with the European General Data Protection Regulation (EU-GDPR) and is under guidance of the data protection officers of the conducting research department. The ethics committee of the German Society of Nursing Science (DGP eV.) approved the conduction of the focus groups on the 14th of April 2024 (application no. 24-007) as part of a larger study on the implementation of a nurse-led unit in a German maximum provider hospital. Participation was voluntary. After receiving written and verbal information on the study including statements on data protection and concordance with the European General Data Protection Regulation (GDPR), all participants provided written informed consent to participation, to analysis of the data obtained and to publication of anonymized results. The study was not of interventional nature. The participating

stakeholder were considered a non-vulnerable population in the study context and participation was not classified as of particular risk.

Consent for publication

Not applicable.

Availability of data and materials

The dataset of the systematic review and the programme theory can be made available upon reasonable request from the authors. Data included in the stakeholder focus group interviews cannot be shared openly, to ensure participant privacy, but may be made available through the authors upon reasonable request and obtainment of consent from the participants. Data are stored in a controlled access data storage at the University of Applied Sciences Bremen.

Competing interests

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Authors' contributions

JP conceptualized the study, developed the InCaD concept, was responsible for methodology, validation, formal analysis, data curation and data analysis, drafted the initial manuscript, and visualized all tables and figures. KS contributed to the conceptualization, methodology and supervision of the study, provided scientific support for the implementation of InCaD in the

study hospital, and contributed to the visualization of tables and figures. RG supported the implementation of InCaD in the study hospital and actively moderated the InCaD sessions. ER were involved throughout the research process and contributed to the development, pilot testing of the questionnaires, and in review and editing the manuscript. HS conceived the subordinate research project and secured funding, was involved throughout the research process and contributed to the development, pilot testing of the questionnaires, and in review and editing the manuscript. All authors critically revised the manuscript, commented on earlier versions, and approved the final manuscript.

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