

Interprofessional weaning boards for invasively ventilated patients in intensive care units: Qualitative interview study with healthcare professionals in Germany

Selina von Schumann  | Charlotte Ullrich | Aline Weis | Michel Wensing | Nicola Litke

Department of General Practice and Health Services Research, University Hospital Heidelberg, Heidelberg, Germany

Correspondence

Selina von Schumann, Department of General Practice and Health Services Research, University Hospital Heidelberg, Im Neuenheimer Feld 130.3, 69120 Heidelberg, Germany.
Email: selina.von.schumann@gmx.de

Abstract

Numbers of mechanically ventilated patients are increasing worldwide. Weaning Boards could support weaning from the ventilator by facilitating interprofessional consultations between Weaning Centers and nonpneumological intensive care units. This study, which is linked to the project *Prevention of invasive Ventilation*, aimed to explore the design and implementation of future Weaning Boards. Semistructured interviews were conducted with physicians, nurses, respiratory therapists, and physiotherapists of intensive care units and Weaning Centers in Baden-Wuerttemberg, Germany. Participants were asked to share their views on (a) required characteristics of Weaning Boards and (b) the current care of weaning patients in their wards. Qualitative data analysis included inductive and deductive steps referring to the Template for Intervention Description and Replication checklist and the Consolidated Framework for Implementation Research. The 14 interviewed healthcare professionals addressed characteristics of future Weaning Boards including (a) preconditions, (b) procedure, (c) interprofessional participants, (d) type of performance, and (d) time frame. Identified determinants for successful implementation were related to (a) individual characteristics of healthcare professionals, (b) ward characteristics, and (c) healthcare system characteristics. Weaning Boards could be a useful tool to advance knowledge sharing between professionals, improve education about weaning protocols, and support patient-oriented care. The implementation of Weaning Boards can be influenced by individual characteristics of participating professionals, difficulties in the interaction between professional groups, the present workplace culture, and the current coronavirus disease 2019 (COVID-19) pandemic.

KEYWORDS

healthcare professional, intensive care, interprofessional care, invasive ventilation, qualitative interview study

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1 | INTRODUCTION

Over the last 20 years, the number of mechanically ventilated patients in intensive care has been described as steadily increasing worldwide due to demographic change and advances in medical technology (Mehta et al., 2015; Schönhofer et al., 2020; Statistisches Bundesamt, 2018a; Stefan et al., 2015). During the coronavirus disease 2019 (COVID-19) pandemic, invasive ventilation increased further, leading to greater medical and political attention. Long-term invasive ventilation is associated with a considerable reduction in patients' quality of life (Huttmann et al., 2018), a high level of distress for their relatives (Khankeh et al., 2021), and high treatment costs for inpatient and post-inpatient care (Hill et al., 2017). Weaning can be complex, however, especially for patients with prolonged invasive ventilation, which varies in definition from more than 96 h to 21 days or longer of ventilation (Hill et al., 2017). These patients are more likely to experience a prolonged or unsuccessful weaning process, which implies a higher risk of mortality and secondary complications from mechanical ventilation (Schönhofer et al., 2020). To provide optimal care for ventilated patients with multimorbidity in intensive care units (ICUs), specialist knowledge and effective interprofessional collaboration are required. The latter is particularly important in respiratory intensive care as many professional groups are involved, including physicians, nurses, and members of therapeutic professions, for example, respiratory therapists and physiotherapists (Bickenbach et al., 2018; Rose et al., 2014).

Various facilities are implemented worldwide to care for prolonged weaning patients (Ambrosino, 2012; Herer, 2020; Kahn et al., 2018). In Germany, there are Weaning Centers (WCs) that include certified ICUs with specialized staff to meet the complex requirements of weaning patients with prolonged ventilation (Schönhofer, 2019). The first German retrospective study including 6899 patients showed that 62.2% of patients, who were transferred to WCs as nonweanable, could be discharged without invasive ventilation after weaning treatment (WeanNet Study Group, 2016). However, the number of WCs in Germany is limited. In 2018, solely 53 ICUs out of 1136 hospitals providing intensive care were certified WCs according to the network WeanNet (Schönhofer, 2019; Statistisches Bundesamt, 2018b). In 2020, the German legislature revised the care of mechanically ventilated patients comprehensively within the Intensive Care and Rehabilitation Strengthening Act to support weaning in ICUs. To improve optimal weaning and utilize the weaning potential of prolonged weaning patients in ICUs, specialized expertise and interprofessional approach of WCs should reach the ICUs of other hospitals. In this context, Weaning Boards (WBs) could be a useful tool involving regular interprofessional discussions of experienced experts of WCs and healthcare professionals at ICUs. So far, no consistent definition of WBs exists. Schlesinger et al. (2018) used the term to describe discussions about weaning patients exclusively within one WC.

Concerning the development of WBs, experiences with tumor boards can serve as orientation. Tumor boards facilitate a comprehensive interprofessional exchange of insights regarding the

diagnosis and management of oncological patients. Despite shared definition and objective, tumor boards vary in participants and structures (Specchia et al., 2020). Previous research showed that the implementation and performance of tumor boards as well as other multidisciplinary team meetings are influenced by a range of determinants, including time, the type of documentation, and the different views on tumor boards of the participating professions (Maharaj et al., 2021; Soukup et al., 2018). Within the project *Prevention of invasive Ventilation* (PRiVENT) WBs will be implemented as part of the intensified weaning treatment. The PRiVENT project focuses on early detection and early intervention to prevent long-term invasive ventilation in high-risk patients. This study is conducted before the pilot phase of the PRiVENT project to support the development of WBs. The objectives of this study were to explore the characteristics of a future WB and to identify determinants associated with its implementation in ICUs and WCs.

2 | METHODS

2.1 | Study design

The qualitative interview study consisted of an explorative, multi-centric, and cross-sectional design (Green & Thorogood, 2018). Semistructured, open-ended interviews and a sociodemographic survey were conducted with healthcare professionals of WCs and ICUs in Baden-Wuerttemberg, Germany. These face-to-face and telephone interviews aimed to identify those characteristics required by a future WB and to determine influencing factors of its implementation. The study was documented according to the Standards for Reporting Qualitative Research (O'Brien et al., 2014; see Supporting Information: Appendix 1).

2.2 | Sample and recruitment

Recruitment took place between October 1 and December 11, 2020. To reflect the variety of professions and work experience of personnel potentially involved in future WBs, purposive sampling was used selecting at least two experts of each professional group of physicians, nurses, respiratory therapists, and physiotherapists. Therefore, employees of four WCs and five ICUs were contacted by e-mail via the PRiVENT network. Interested professionals were sent further information material. Subsequently, snowballing was used by distributing information to potentially interested healthcare professionals through interviewed participants.

2.3 | Inclusion criteria

The beforementioned healthcare professionals currently working in a WC or an ICU in Baden-Wuerttemberg, Germany were eligible to participate in the study. Further inclusion criteria were: age \geq 18, the

ability to give consent, and to have proficient oral and written German language skills. All interviewees had to give written informed consent for participation. The interviewees did not receive any reimbursement for their participation in the study.

All those who did not meet the above inclusion criteria were excluded. Specifically, one person was excluded since she was in the ICU for an internship and did not work there as an examined physiotherapist. Participants could withdraw their consent at any time without indicating reasons.

2.4 | Data collection

The interview guide (see Supporting Information: Appendix 2) was developed based on literature research considering the predefined research objectives, adjusted for WCs and ICUs due to their specific focus areas. Pilot interviews were conducted with a physiotherapist and an advanced medical student, both experienced in intensive care. Subsequently, the interview guide was modified linguistically where recommendations were made. Sociodemographic data of the participants were collected before the interviews using a questionnaire that recorded age, gender, professional group, employment situation, area of expertise, and previous work experience. All interviews were digitally audiotaped, deidentified, and transcribed verbatim. Qualitative interview data were collected to the point of redundancy and no additional themes were identified. In total, 14 interviews were conducted between October and December 2020 (SvS). Interview duration ranged from 13:55 to 47:05 min (mean 24:37). To accommodate participants' preferences, 10 telephone and 4 face-to-face interviews at the respective workplaces were conducted. All interview quotes provided were translated from German into English with due diligence indicating the participant's professional group and distinct work setting.

The interviewed healthcare professionals (female = 6, male = 8) were between 28 and 61 years old (mean 44) working in eight different clinics in Baden-Wuerttemberg, Germany. The professionals were physicians ($n = 4$), nurses ($n = 3$), respiratory therapists ($n = 4$), and physiotherapists ($n = 3$). Their work experience ranged from 6 to 40 years (mean 20). Twelve participants had a full-time and two had a part-time occupation. Table 1 provides further details about the participants' characteristics. These are divided into employees of WCs ($n = 7$) and ICUs ($n = 7$) to show the potential differences of participants in the two work settings. Although one ICU specialized in the treatment of respiratory diseases, structurally it did not count as a WC in this study, as it was not officially certified as a WC.

2.5 | Data analysis

Qualitative data were analyzed following the basic steps of thematic analysis (Braun & Clarke, 2006). After familiarization with the data, initial codes were created inductively. Subsequently, themes were generated considering two pre-existing frameworks to support

TABLE 1 Detailed information on interviewees divided into WC and ICU

	Value, n (%) or mean, range
<i>Weaning Center ($n = 7$)</i>	
(1 physician, 1 nurse, 3 respiratory therapists, 2 physiotherapists)	
Age in years, mean, range	40, 29–57
Work experience in years, mean, range	18, 6–40
Gender, n (%)	
Female	4 (57%)
Male	3 (43%)
<i>Intensive care unit ($n = 7$)</i>	
(3 physicians, 2 nurses, 1 respiratory therapist, 1 physiotherapist)	
Age in years, mean, range	48, 42–61
Work experience in years, mean, range	21, 14–32
Gender, n (%)	
Female	2 (29%)
Male	5 (71%)

Abbreviations: ICU, intensive care unit; n , number; WC, Weaning Center.

systematic analysis and clear presentation of the findings: (a) the Template for Intervention Description and Replication checklist (Hoffmann et al., 2014) to explore specific characteristics of future WBs and (b) the Consolidated Framework for Implementation Research (Damschroder et al., 2009) to determine contextual factors of the current patient care that could influence the implementation of WBs. Data that did not fit into the two frameworks were labeled and corresponding themes were defined. Overall, themes were distinguished by professional group or work setting when applicable. For coding MAXQDA Plus 2020, release 20.2.0 was used, for describing sociodemographic characteristics Microsoft Excel, version 2101.

2.6 | Research team and reflexivity

The research group consisted of a female full-time student (SvS) of the Master program Health Services Research and Implementation Science in Healthcare Systems at the University of Heidelberg. Her educational background included a bachelor's degree in physiotherapy, giving her extensive knowledge and hands-on experiences in the healthcare sector. She was supported by three female supervisors (NL, CU, AW) and a male professor (MW) with backgrounds in health and social sciences working in the Department of General Practice and Health Services Research at the Heidelberg University Hospital. All had considerable experiences with qualitative methods from previous research projects. In addition, SvS was supported by a qualitative research colloquium within the mentioned Master program led by two experienced research fellows and several peer junior researchers.

3 | RESULTS

The results show both a variety of structural and content-related characteristics that a future WB would need to have as well as contextual factors of current patient care that could have an impact on the implementation of WBs. In the following, the characteristics of a future WB are summarized. Afterwards, the contextual factors are presented in more detail. Some of these were more general, others ward-specific, or emerged from comparing WCs and ICUs.

3.1 | Characteristics of WB

Potential characteristics of future WBs mentioned by interviewees were (a) organizational preconditions and fundamental principles, (b) basic procedure and content, (c) multiple professionals, (d) types of performance, and (e) time frame. Table 2 presents a comprehensive overview including the main quotes of the analyzed themes.

The necessary preconditions within WBs were an additional theme to the framework developed through the suggestions of interviewees from both work settings. An ICU employee noted that it could be beneficial if ICUs in a particular region were assigned to a specific WC. Interviewees requested a collegial atmosphere as well as open-mindedness regarding discussions about treatment plans. A basic process could be identified within the data including a registration form and an interprofessional discussion about treatment options via phone call or a live connection, that is, either video conferencing or another type of telemedicine, resulting in a documented treatment plan. However, interviewees expressed concerns regarding technology and equipment with all types of telemedicine. Occasionally, interviewees also described their own insecurities concerning the most efficient procedure. Concerning the content of WBs, healthcare professionals highlighted the importance of sufficient patient data and the status of the patient's weaning.

Although interviewees from both work settings agreed that a variety of healthcare professions should be represented in WBs, they had different ideas on the specific participants. Overall, interviewees favored a flexible adjustment concerning the time frames of discussion of a single patient case and the frequency of WBs depending on their needs.

3.2 | Determinants of implementation

Besides the highlighted characteristics of a WB, the interviews revealed additional factors within the current patient care that influence its implementation (see Table 3).

3.2.1 | Characteristics of individuals: Knowledge and beliefs about the intervention

Overall, the interviewees expressed a favorable attitude toward the initiation of WBs. They anticipated that WBs could efficiently support

ICUs that have less experience with patients in prolonged weaning or lack a network of experienced professionals specialized in that field. "I think this would be incredibly beneficial. I believe that healthcare in many German intensive care units could be significantly optimized in this regard." (WC physiotherapist 2, 19) Healthcare professionals from both work settings expected positive effects in various areas, especially concerning patient outcomes. WBs were considered as an opportunity to solve small misunderstandings in patient care and to utilize all possible treatment strategies. By supporting these ICUs, interviewees estimated that patients' ventilation hours and length of stay could be shortened. Interview participants believed that, as a result, the need for patient transfers to WCs could be reduced and patients' quality of life would improve after having been successfully weaned. "So if it [Weaning Board] is used regularly and one can ultimately also agree to constructively implement the decisions that are made there, then I can easily imagine that transferring a patient could definitely be avoided." (ICU physician 3, 110).

Interviewees also expected the WBs and a common thread in therapy result in an improvement of interprofessional collaboration within the participating ICUs due to an agreed documented treatment as well as a reduction of workload leading to a more pleasant and energetic working atmosphere. Healthcare professionals anticipated that the appreciation and knowledge about each participants' individual area and responsibilities could increase as well. Besides these expected advantages for ICUs, interviewees from WCs anticipated being able to help more patients by sharing their knowledge and gaining insight into the care provided in other ICUs. One ICU physician hoped WBs would lead to a "faster and better care which is cheaper in the end." (ICU physician 2, 18).

Interviewees also expressed potential challenges in implementing WBs in terms of structural characteristics, for example, a perceived lack of available working hours. Recruiting small ICUs to participate in WBs was also seen as a challenge, especially if ICUs only had a few patients with prolonged or difficult weaning. Interviewees highlighted that the implementation's success will depend on the attitude of the participating healthcare professionals. Interviewees from both settings assumed acceptance difficulties of the intervention by healthcare professionals of other ICUs. These were ascribed to feeling undermined in their own competence, the impression of the WB interfering with existing treatment plans, and the admission of lacking knowledge concerning the weaning treatment. Two interviewees of the pneumological ICU voiced the opinion that WBs were redundant in their own ICU because they already felt well-trained regarding the treatment of patients in prolonged weaning.

3.2.2 | Characteristics of individuals: Other personal attributes

In relation to the potential usage of telemedicine in WBs, healthcare professionals were asked about their experiences with telemedicine. Commenting on video conferencing, interviewees' experiences ranged

TABLE 2 Suggested characteristics of Weaning Boards

Category	Short description of suggested characteristics	Quotations
Organizational preconditions and fundamental principles	<ul style="list-style-type: none"> Requirements within Weaning Boards (period without disruptions, data protection, integrated into current working routines) Clarification with the managing director of the hospital Collegial, interactive atmosphere 	<p>"(...) an important precondition is that the people involved can really take this time without being disturbed, i.e. that the phone is not ringing all the time." (ICU nurse 1, I13)</p> <p>"You probably have to make people realize that we do not want to sell anything. (...) Make it clear that this is a win-win situation for both sides, and the effort in relation to the success is easily manageable." (ICU physiotherapist 1, I11)</p>
Basic procedure and content	<ol style="list-style-type: none"> Registration form with patient data Introduction of the participating stakeholders Presentation of the patient case Interprofessional discussion (knowledge sharing and support) <ul style="list-style-type: none"> Evaluation of weaning potential, assistance in secretion, cannula, and mobilization management Sufficient patient data Discharge management (outpatient care, rehabilitation options, and the use of social services) Pilot test to evaluate the practical feasibility of Weaning Boards Evaluation of Weaning Boards Peer review approach 	<p>"I think it is important to report standardized information in advance, like on the Tumor Board. For me, that means criteria like the patient's demographic data, the time of intubation and ventilation, relevant comorbidities and previous treatments." (ICU physician 1, I6)</p> <p>"(...) doctor and nurse should first introduce the patient, everything that belongs to it and describe the situation in which one finds oneself now. - Then there should be time for questions and exchange. - And based on the professional exchange, that then - according to the advice of the staff of the Weaning Center, a plan is agreed upon." (ICU nurse 1, I13)</p>
Interprofessional participants	<ul style="list-style-type: none"> WC: ranging from experienced physician to nurses and therapists ICU: ranging from physician and nurse to all professional groups Additional professionals on call 	<p>"(...) the chief, the managing intensive care nurse and the senior physician in charge of the unit, and if it is possible in such a board, I would always find it useful that the assistant doctor who looks after the patient plus a nurse who looks after him or her over several shifts, so that they can and should listen, I think that helps." (ICU physician 1, I6)</p> <p>"So I think that of course the experienced center should have a respiratory therapist as a representative from the front, so to speak, and there should be a doctor with intensive weaning experience, and one should also not forget (...) that we certainly also need someone from out-of-hospital areas such as social services or something like that." (ICU physician 2, I8)</p>
Types of performance	<ul style="list-style-type: none"> Registration and therapy planning forms Phone call Live connection (video conferencing, other type of telemedicine) Adaptation to the ICU's needs 	<p>"(...) so that you can somehow take a quick look at the patient via video conference." (WC respiratory therapist 1, I2)</p> <p>"That would certainly be good and then you can also work locally, which means that all the people at the weaning clinic, at the special clinic, do not have to physically walk from five different offices into one room, but - everyone can stay in their own office and - that way you also save distances and resources." (ICU physician 2, I8)</p>
Adaptable time frame	<ul style="list-style-type: none"> Individual Weaning Board: ranged from 5 to 30 min per patient 	<p>"(...) maybe at the beginning twice a week and then I would extend it." (WC nurse 1, I3)</p>

(Continues)

TABLE 2 (Continued)

Category	Short description of suggested characteristics	Quotations
	<ul style="list-style-type: none"> Time between two Weaning Boards: ranged from 48 h to 4 weeks 	<p>"I think once a month should be enough and the possibility on call with a lead time of two to three days for example." (ICU physician 1, 16)</p> <p>"(...) the other side also has to get to grips with these cases first. They are usually complex. And I think you should plan on 20 to 30 min. -- And because it can sometimes take longer via a video conference or something like that, that would be my estimation." (ICU physician 2, 18)</p>

Abbreviations: I, interview; ICU, intensive care unit; WC, Weaning Center.

TABLE 3 Factors influencing the implementation of Weaning Boards

CFIR domain	CFIR subcategory	Factors influencing implementation of Weaning Boards
Characteristics of individuals	Knowledge and beliefs about the Intervention	<ul style="list-style-type: none"> Favorable attitudes Assumed critical aspects
	Other personal attributes	<ul style="list-style-type: none"> Different experiences with video conferencing Knowledge gap concerning weaning
Inner setting	Structural characteristics	<ul style="list-style-type: none"> Changes caused by the COVID-19 pandemic Differences in structure, procedures, and professionals
	Network and communications	<ul style="list-style-type: none"> Existing interprofessional rounds Collaboration difficulties
	Culture	<ul style="list-style-type: none"> Principles and challenges
Outer setting	Patient needs and resources	<ul style="list-style-type: none"> Challenges with prolonged weaning patients Demand for using weaning-protocol
	Cosmopolitanism	<ul style="list-style-type: none"> Patient transfer Knowledge sharing between clinics
	External policy and incentives	<ul style="list-style-type: none"> Disincentives

Abbreviation: CFIR, Consolidated Framework for Implementation Research.

from none, only a few attendances and regular use. Except for one ICU, meetings via video conference were considered feasible. However, some technical insecurities were admitted as participants mentioned that video conferencing call quality failed occasionally. None of the interviewees had personal experiences with other types of telemedicine, although some had heard about the use of robots at the patient's bedside. Furthermore, several physiotherapists and nurses from both settings pointed to a gap in knowledge about the overall process of weaning patients, including patient transfer, weaning treatment, and ongoing knowledge sharing between ICUs and WCs. Moreover, one ICU physician stated that there was limited knowledge about the challenges of prolonged weaning among those involved in general.

3.2.3 | Inner setting: Structural characteristics

In the interviews, differences in structural characteristics of wards, such as numbers of beds and mechanical ventilation devices,

emerged. Moreover, interview participants mentioned various structural changes due to the COVID-19 pandemic, for example, visits from patients' relatives were limited and the number of mechanically ventilated patients and ventilator equipment increased. One interviewee reported that the increased number of patients in the ICU had led to reduced physiotherapy per patient. Interviewees who addressed the COVID-19 pandemic described an increased workload except for one nurse who stated that the workload had reduced in the ICU because of the mentioned restrictions for patient visitors and cancellations of nonessential surgeries to be prepared for inpatient care of potential COVID-19 patients.

The core team of professionals involved in intensive care of patients in prolonged weaning was similar within WCs and the noncertified pneumological ICU, consisting of pneumologists, nurses, respiratory therapists, and physiotherapists. Differences referred to additional professionals providing occupational and speech therapy, psychological care, and social services. Most interviewees of nonpneumological ICUs expressed the absence of pneumologists, respiratory therapists, and

speech therapists. Since interviewees suggested that these professional groups should take part in the WB, a discrepancy between the current employment situation and their vision for WBs was revealed. Despite the availability of speech therapists in WCs, participants of these wards highlighted the need for more speech therapy. "speech therapist, who comes here [Weaning Center] only twice a week, I think that is a shame because some patients simply have a much higher demand;" (WC respiratory therapist 1, I2).

3.2.4 | Inner setting: Networks and communications

Healthcare professionals from both work settings highlighted inter-professional rounds in their wards. However, only employees of WCs and the pneumological ICU mentioned further discussions regarding the weaning of mechanically ventilated patients. Participants from one WC described a weekly weaning discussion including nurses and therapists. Besides structured discussions, interviewees valued further agreements without a planned meeting between different professional groups. However, interview participants from both work settings mentioned various critical issues in terms of communication. One expressed concern addressed insufficient interactions between professionals that could result in ineffective care. In this context, a different understanding of medical terms was described as another challenge. Interviewees explained that, occasionally, professional groups understood medical terms and instructions differently. "I think a significant problem is actually the language. I often notice in different therapy disciplines that things communicated by physicians are understood completely differently in the nursing profession than in the therapeutic profession." (WC physio-therapist 2, I9).

3.2.5 | Inner setting: Culture

A positive prevailing mood of the current work atmosphere was derived from the interviews. Two interviewees, one from a WC and one from an ICU, spoke of mutual appreciation and respect in their wards and considered this to be essential for a successful WB. Critically, healthcare professionals emphasized that the prevailing principle of working in a patient-oriented way and less in a profit-oriented way benefits the patient and allows work to be more satisfying. According to the interviewees' experiences of previous employers, the profit-oriented way was often present in other ICUs.

that is also a problem for many patients, because they simply lie in acute clinics for too long without therapeutic treatments, where only the money counts, and that is a bad thing. In our hospital, I have to say that this is not the case. When a patient no longer needs ventilation, ventilation is discontinued even if he only has two to three days until the next [reimbursement] limit, which I find very pleasant; (WC respiratory therapist 2, I5)

3.2.6 | Outer setting: Patient needs and resources

Healthcare professionals highlighted challenges in weaning patients, for example, dealing with comorbidities, delirium, and severe sedation. They assumed that the broad differences in patient conditions and patient needs could affect WBs. "it [Weaning Board] also depends on the patient's problems, some patients are weaned within a week and some patients are here for four weeks and we make little progress." (WC respiratory therapist 1, I2).

In this context, the need for using a weaning protocol was emphasized. Interviewees stated that knowing about weaning protocols was essential to effectively wean patients. Another mentioned aspect was related to home mechanical ventilation. Healthcare professionals explained that patients who were not successfully weaned in hospital, often depend on full-time care at home as they require long-term invasive ventilation. In this context, ICU participants referred to the challenges of finding adequate nursing services alongside the immense costs related to patient care in shared apartments for ventilated patients. Moreover, healthcare professionals demanded to re-evaluate this patient group's weaning potential periodically, as re-examination often does not take place.

3.2.7 | Outer setting: Cosmopolitanism

In the analysis, two types of interactions between ICUs and WCs were identified. One was related to structured patient transfers, including a phone call, online request or fax from employees of the ICU to the WC to discuss the possibility of taking over the patient. The second type included unstructured knowledge sharing via phone. Physicians of WCs and the pneumological ICU explained that they often received phone calls from relatives of home-ventilated patients or physicians of nonpneumological ICUs they knew personally. In addition, one respiratory therapist explained frequently sharing knowledge with respiratory therapists of other clinics. However, one intensive care nurse explained that knowledge sharing between WCs and ICUs was limited because of different ward structures and patient populations.

I also imagine it to be very difficult because the specialist clinic [Weaning Center] treats weaning patients exclusively, and we always take care of such a mixture. We have acute patients, patients with severe illnesses including weaning challenges, and pure weaning patients. (ICU nurse 2, I14)

As already identified within ICUs, interviewees also described the different use of medical language between wards as a challenge. Hence, the need for clear and specific terms of medical language was declared.

3.2.8 | Outer setting: External policy and incentives

Interviewees from both settings criticized the disincentives caused by the refunded ventilation hours based on the classification system of Diagnosis Related Groups in Germany. They shared the view that the higher reimbursed ventilation thresholds, rather than the patient's underlying condition, often determined patients' therapy. Moreover, these thresholds were indicated to be one of the reasons for the delay or failure to transfer these patients.

I know from the acute clinic, there were these ventilation thresholds of 250, 500, 1000 h which were processed. If the patient had 800 h, you simply waited for ten days to get the patient to 1000 h of ventilation. (WC respiratory therapist 2, I5)

4 | DISCUSSION

Besides the interviewees' demand for flexible adaptation of conducting WBs, required characteristics included (a) time, personnel, and financial preconditions, (b) a basic procedure and content to discuss, (c) the participating professional groups, (d) the types of performance, and (e) a time frame. Identified determinants for the successful implementation were related to (a) individual characteristics, including different competencies, positive beliefs about the intervention's effects but also expected challenges regarding the implementation of WBs, (b) ward characteristics, including similar interprofessional rounds but different structural features and communication difficulties, (c) healthcare system characteristics, including general challenges in weaning patients, interactions between clinics, and disincentives due to the German reimbursement system.

4.1 | Characteristics of WB

Findings of this study revealed personnel and financial requirements as well as time to be essential for a successful WB, which corresponds to research concerning effective multidisciplinary teams (Fleissig et al., 2006). Besides sufficient and undisturbed time for the consultation, researchers pointed out the need for an appropriate amount of organizational preparation time (Lamb et al., 2011). A flexible adaptation of the WBs was demanded in multiple aspects. Concerning participants of tumor boards, the rearrangement depends on the type of cancer or hospital size (Specchia et al., 2020). Consistent with the interviews, Prades et al. (2015) identified core participants including medical specialists as well as participants from medical and nonmedical backgrounds for support. Interview findings indicated the demand to include further professions, namely respiratory therapists and speech therapists even though some interviewees stated that these professions are not available on their

ward. This discrepancy needs further investigation and must be considered when implementing WBs.

Study findings allowed us to establish several ways to conduct WBs. This is consistent with the existing variety of tumor boards with similar definitions and goals but different characteristics (Specchia et al., 2020). The perception that video conferencing is an effective tool for conducting WBs can have a positive impact on the consultation's effectiveness (Kahn et al., 2019). Results of a cluster-randomized trial in the United Kingdom identified multidisciplinary team meetings via video conferencing to be cost-effective at a yearly rate of 20–30 meetings. However, Kunkler et al. (2007) pointed out that video conferencing can slow down the team as only a reduced number of patients can be discussed compared with the in-person multidisciplinary team meetings. A pilot phase of WBs could be used to determine an adequate, potentially adaptable time frame.

4.2 | Determinants of implementation

A favorable attitude towards a new intervention as demonstrated by interviewees concerning WBs has been identified to support effectiveness in previous research (Kahn et al., 2019). However, participants anticipated a lack of acceptance among ICU employees to be recruited because they may not want to admit their lack of knowledge concerning weaning treatment. In contrary to naming the misgiving, ICU interviewees of the study stated that this did not apply to them personally. However, using the project PRiVENT network for recruitment could imply a bias because interviewees might have already been interested and had a favorable opinion towards a new intervention in this domain. In contrast, healthcare professionals of the pneumological ICU expressed no need for weaning support as they felt already knowledgeable in this field. These statements could be addressed by conducting a needs assessment of the ICUs before the implementation of a WB. Although social desirability bias might have been expected, some participants admitted having a knowledge gap regarding the process and content of weaning. Especially in prolonged weaning, profound knowledge of pathophysiology and patients' comorbidities is needed (Storre & Schönhofer, 2017). Therefore, the discussion within WBs could include education about weaning protocols.

Consistent with the current situation in Germany, the study findings revealed differences in wards regarding structure, processes, and employees (Blum, 2017). General recommendations for structure and equipment in terms of quality indicators are given by the German Interdisciplinary Association for Intensive Care and Emergency Medicine (Deutsche Interdisziplinäre Vereinigung für Intensiv- und Notfallmedizin) (Kumpf et al., 2017). However, since using these quality indicators is not mandatory in Germany, their use remains unclear. In contrast, WCs must meet certain criteria for certification, including the employment of a respiratory therapist, who is absent in most nonpneumological ICUs (Schönhofer et al., 2014). Moreover, many ICUs do not have permanent physiotherapists assigned to

the ward for a longer period resulting in discontinuous work with patients, especially in prolonged weaning (Schwabbauer et al., 2017). Besides, healthcare professionals highlighted structural changes caused by the COVID-19 pandemic which was also examined in an online survey with hospital employees across Germany (Kaltwasser et al., 2021). This situation could influence the implementation of WBs, as an excessive workload harms decision-making and lowers team morale (Lamb et al., 2011). The different structural and personnel conditions could lead to differences in WBs depending on the individual characteristics of the ICU.

Current research supports interviewees' demand for re-evaluating the weaning potential of invasively ventilated patients in outpatient care (Klingshirn et al., 2020). This finding did not fit in with the idea of WBs as they are planned discussions of the responsible WC and its respective ICUs. However, further research and interventions should include these patients as a recent review exposed insufficient assessment and usage of their weaning potential (Klingshirn et al., 2020).

4.3 | Strengths and limitations

Data collection was supported by the possibility to choose between face-to-face and telephone interviews (Tong et al., 2007). Furthermore, many perspectives could be considered due to the involvement of multiple professional groups crucial in the weaning process of mechanically ventilated patients. However, professional groups, for example, speech therapists and occupational therapists, could have added further aspects. Data collection through semistructured interviews proved to be suitable as they allowed gaining knowledge about a new intervention during its development, thereby capturing individuals' perspectives in an unconstrained setting. However, focus groups could have revealed perspectives and ideas that were not analyzed in individual semistructured interviews, for example, regarding multiprofessional teamwork (Sinuff et al., 2007). As most interviews were conducted during interviewees' working time on their wards, these conditions might have influenced the interview duration and information content. Considering the Template for Intervention Description and Replication checklist and the Consolidated Framework for Implementation Research in the analysis supported the exploration of themes and subthemes. Through these concepts analyzed themes could be categorized and summarized. However, the use of two concepts was time-consuming and the inductive coding was potentially influenced to some extent.

5 | CONCLUSION

The suggested characteristics of WBs can be used as a starting point for the pilot phase of the PRiVENT project, where they will be defined in detail, subsequently implemented, and tested. Overall, a flexible conduction as well as addressing time, personnel, and financial preconditions in

advance seem to be crucial. The availability of professionals and an adequate time frame need further research. Altogether, WBs could be a useful tool to advance knowledge sharing between professionals and to support patient-oriented care. The implementation of WBs can be influenced by the individual characteristics of participating professionals, difficulties in the interaction between professional groups, and the current COVID-19 pandemic. Therefore, it could be useful to analyze current circumstances of each participating ward and adapt WBs to its needs. Besides, WBs could serve to enhance interprofessional communication and increase participants' knowledge about the overall weaning process.

AUTHOR CONTRIBUTIONS

Selina von Schumann was responsible for the conceptualization, methodology, interview conduction, data analysis, and original draft writing. Nicola Litke supported through supervision, data analysis, and reviewing. Charlotte Ullrich assisted with the interview guide, data analysis, and reviewing. Aline Weis as well as Michel Wensing provided supervision throughout the entire study and reviewed the manuscript. All authors read and commented on the final version of the manuscript.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

For this study, ethical approval was obtained from the Ethics Committee of the Medical Faculty Heidelberg (S-634/2020) on September 18, 2020.

ORCID

Selina von Schumann  <http://orcid.org/0000-0001-7565-623X>

PEER REVIEW

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SUPPORTING INFORMATION

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