THE INTERNATIONAL JOURNAL OF
CLINICAL PRACTICE WILEY

Long-term effects of perioperative briefing and debriefing on team climate: A mixed-method evaluation study

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Abstract

Introduction: To evaluate the long-term (5 years) effects of perioperative briefing and debriefing on team climate. We explored the barriers and facilitators of the performance of perioperative briefing and debriefing to explain its effects on team climate and to make recommendations for further improvement of surgical safety tools.

Methods: A mixed-method evaluation study was carried out amongst surgical staff at a tertiary care university hospital with 593-bed capacity in the Netherlands. Thirteen surgical teams were included. Team climate inventory and a standardised evaluation questionnaire were used to measure team climate (primary outcome) and experiences with perioperative briefing and debriefing (secondary outcome), respectively. Thirteen surgical team members participated in a semi-structured interview to explore barriers and facilitators of the performance of perioperative briefing and debriefing.

Results: The dimension "participative safety" increased significantly 5 years after the implementation of perioperative briefing and debriefing ($P = .02$ (95% confidence interval 1.18-9.25)). Perioperative briefing and debriefing were considered a useful method for improving and sustaining participative safety and cooperation within surgical teams. The positive aspects of briefing were that shared agreements made at the start of the day and that briefing enabled participants to work as a team. Participants were less satisfied regarding debriefing, mostly because of the lack of a sense of urgency and a lack of a safe culture for feedback. Briefing and debriefing had less influence on efficiency.

Conclusions: Although perioperative briefing and debriefing improve participative safety, the intervention will become more effective for maintaining team climate when teams are complete, irrelevant questions are substituted by customised ones and when there is a safer culture for feedback.

1 | INTRODUCTION

The operating room (OR) is a high-risk environment where adverse events are likely to happen.[1] Adequate surgical care depends not only on technical skills but also on non-technical skills such as effective teamwork and communication amongst healthcare professionals.[2] The surgical team comprises many different disciplines (eg, surgical team and anaesthesiology team); collaboration between these disciplines requires thorough coordination, planning and co-operation.[3] Every team member is responsible for delivering the best possible care, yet at the same time each one team member has a different task in the shared OR. Given that improving team-working ability is associated with reduced technical errors, enhancing team performance and team-working ability in the OR should lead to increased patient safety.[4,5]

Several interventions have been introduced in an attempt to address adverse events because of technical and non-technical errors in the OR, such as surgical checklists (eg, time-out and sign-out) and crew resource management.[6-8] Over the last few years, studies have shown that these interventions reduce communication failures and adverse events such as wrong-site surgery (time-out).[6-8] The OR remains an increasingly complex environment. Globally, 16.8% of the patients undergoing elective surgery develop one or more postoperative complications and 0.5% die as a result of complications.[9] The majority of in-hospital adverse events (39.6%) were related to surgery.[10] A study of 19 Dutch hospitals showed that 3.1% of patients experienced potentially preventable harm.[11] Surgical departments were significantly more involved in potentially preventable harm to patients than non-surgical departments.[11]

Surgical briefings have contributed in particular to team-working ability and the teamwork-related sociocultural aspects that checklists do not address.[12] Briefings aim at sharing information and opening up communication. Exchanging information clarifies expectations and creates shared mental models, which will reduce ambiguity and clarify everyone's role in the team.[13] Debriefings provide an opportunity to review the operative events and findings as well as to communicate postoperative plans. It aims at fostering learner performance, the ability to correct errors, clinical reasoning through reflection and (peer) feedback.[14,15] On top of that, Leong et al[16] show that perioperative briefing and debriefing also affect team climate positively.[16]

While it is generally known that these types of interventions have a positive effect on patient safety outcomes and teamwork, the long-term effects are relatively undiscovered.[16] Moreover, there remains resistance from surgical staff towards perioperative briefing and debriefing.[17] For example, they often complain about the administrative burden of patient safety interventions. Physicians spend, on average, 1.7 hours per day to non-patient-related administrative work, which accounts for approximately one-sixth of their total working hours.[18] Additionally, physicians express mixed attitudes towards the utility of such methods in reducing morbidity and mortality. It is hard to quantify the effects of perioperative briefing and debriefing on patient safety outcomes.[19] Moreover, standardised

What's known

- The operation room is a high-risk environment where adverse events are likely to happen.
- Good team climate in surgical teams is required to provide safe care.
- Perioperative briefing and debriefing affect team climate positively.

What's new

- Perioperative briefing and debriefing are considered a useful method for improving and sustaining participative safety and cooperation within surgical teams.
- We make recommendations for further improvement of perioperative briefing and debriefing.

methods for perioperative briefing and debriefing are lacking and the methods are rarely evaluated.[2]

Therefore, the aim of the present study was to evaluate the long-term (5 years) effects of perioperative briefing and debriefing on team climate. In addition, we explored the experiences and the barriers and facilitators of the performance of perioperative briefing and debriefing to explain the found effects and to make recommendations for further improvement of such surgical safety tools.

2 | METHODS

2.1 | Study design, population and measurements

In a mixed-method study, we aimed to evaluate the long-term (5 years) effects of perioperative briefing and debriefing on team climate. The study was carried out amongst surgical staff members at a tertiary care university hospital with 593-bed capacity in the Netherlands.[16]

We included eight surgical teams: cardiothoracic surgery (CTS), general surgery (GS), ear-nose-throat surgery (ENT)/oral and maxillofacial surgery (OMF), orthopaedic surgery (ORTHO), neurosurgery (NES)/plastic surgery (PLS), eye surgery (EYS), urology (URO) and obstetrics/gynaecology (OB/GYN). These surgical teams represent the entire operating theatre. The surgical teams are mostly consistent during the day and consist of the following staff: surgeon, surgical resident, fellow surgeon, anaesthesiologist, anaesthesiology resident, OR assistant and anaesthetic assistant.

2.2 | Perioperative briefing and debriefing

In 2019, perioperative briefing and debriefing were integrated into the eight surgical teams above after stepped wedge implementation in 2014.[16] Both briefing and debriefing have now become a standard

element of the surgical care process and are carried out alongside the time-out and sign-out procedures. Perioperative *briefing* is a surgical team activity that takes place before the first patient arrives in the OR. The aim is to share essential information for that day, stimulate mutual support for specific day tasks and to resolve expected technical or logistical problems immediately. Perioperative *debriefing* is also a surgical team activity, but takes place at the end of the surgical programme. During postoperative debriefing, the team evaluates both the positives as well as the problematic issues of the day. Postoperative debriefing is aimed at identifying the lessons learnt shortly after surgery for improving team performance and the operative processes. All surgical team members are expected to participate in both briefing and debriefing. To structure and standardise perioperative briefing and debriefing, a "briefing card" is used (Appendix S1). The OR assistant mostly guides these processes.[16]

2.3 | Data collection

A mixed-method approach was used to gain insight into the association between perioperative briefing/debriefing and team climate: (a) two surveys: one to measure team climate, the other to evaluate experiences with perioperative briefing and debriefing of the surgical teams, and (b) semi-structured interviews to explore the barriers and facilitators of the performance of perioperative briefing and debriefing.

2.3.1 | Team Climate Inventory

We used the Team Climate Inventory (TCI) to measure team climate in the included surgical teams. The TCI is developed by Anderson and West and is a widely used validated survey.[20-23] A 5-point Likert scale was used, ranging from 1 ("disagree strongly") to 5 ("agree strongly"). The TCI measures team climate based on four climate dimensions essential for successfully implementing innovations such as perioperative briefing and debriefing: (a) participative safety, (b) support for innovation, (c) vision and (d) task orientation. Participative safety acknowledges that trust is essential for members' involvement, which is especially important for the successful performance of perioperative briefing and debriefing. Detailed information on the TCI is described elsewhere.[20,24,25] The TCI was conducted in 2014 (4 months after the implementation of perioperative briefing and debriefing), 2016 (2.5 years after implementation) and in 2019 (5 years after implementation).

2.3.2 | Standardised evaluation questionnaire

We used a short standardised evaluation questionnaire to evaluate team members' experiences with perioperative briefing and debriefing. All members of the eight surgical teams received this questionnaire together with the TCI. Questions were presented as statements and covered the topics "cooperation within the surgical team" and "work efficiency." We used a 5-point Likert scale ranging from 1 ("disagree strongly") to 5 ("agree strongly") with the statements. Participants were also given the opportunity to report the perceived strengths and limitations of briefing and debriefing.[16]

2.3.3 | Semi-structured interviews

For a more in-depth understanding of experiences with perioperative briefing and debriefing and the impact on team climate, a trained and experienced researcher (MS) conducted 13 semi-structured interviews (face to face) at the workplace. The interviews lasted approximately 45 minutes and were audiotaped. We developed an interview topic guide (Appendix S2) partly based on the results of the short standardised evaluation questionnaire. After evaluating two interviews, the interview topics were: (a) perceived influence of perioperative briefing and debriefing on team climate, (b) experiences with perioperative briefing and debriefing, (c) perceived barriers and facilitators on the performance of perioperative briefing and debriefing and (d) recommendations for improvement. We also collected relevant interviewee characteristics (job function and years of experience in current job function).

The interviews took place between June 2019 and November 2019. We used purposive sampling to ensure a representative sample of interviewees in terms of job function and years of experience. Variation in job function (surgeon, surgical resident, anaesthesiologist, anaesthesiology resident, OR assistant and anaesthetic assistant) and surgical team were taken into account to create a diverse sample. The interviewees were informed about the aim of the study by e-mail and provided written informed consent at the start of the interview. In total, 17 surgical team members were approached to participate in an interview. Three team members did not respond in spite of a reminder e-mail and two team members wanted to participate but were unable to find time for the interview. One team member who had not been approached by e-mail decided to participate together with his colleague at the time of his colleague's interview. A total of 13 surgical team members were included in the semi-structured interviews.

2.4 | Data analyses

Before data analyses, the data were checked to identify out-of-range answers, inconsistent responses and missing data. There were no missing data in 2014 and 2016; in 2019, we excluded two respondents because of missing values. We calculated the response rates of the TCI and evaluation questionnaire.

2.4.1 | Team climate

Scores per dimension were generated in percentages, with a higher value representing greater team climate (range, 0-100%). Scores

per subdimension depended on the number of questions related to that specific subdimension. If, for example, the subdimension entailed three questions, the maximum score for that subdimension was 3×5 (5-point Likert scale) = 15 points. The score was then calculated as first dimension score/15 × 100%. The dimension score is the mean of all according to subdimension scores. The overall TCI score comprises the mean scores of all four dimensions. A linear mixed model was used to measure changes in the TCI scores in 2016 and 2019 compared with 2014 (baseline). We adjusted for the clustering of surgical teams. If this model provided no fit of the data, we omitted the random effect for teams. A *P*-value of ≤.05 was regarded as statistically significant. The statistical software IBM SPSS V.25 was used for all statistical analyses and data processing.

2.4.2 | Experiences with perioperative briefing and debriefing

The surgical team members' experiences were assessed using descriptive statistics. Respondents were regarded as having a "positive" experience to perioperative briefing and debriefing if they (strongly) agreed with the question (≥4 on the 5-point Likert scale). We tabulated the perceived strengths and limitations of perioperative briefing and debriefing and counted the most frequently mentioned strengths and limitations.[26]

2.4.3 | Perceived barriers and facilitators of perioperative briefing and debriefing

All audio recordings were transcribed verbatim according to a standardised format. Two researchers (MS and MH-S.) analysed the first four interviews independently, discussed the analysis and developed a framework for coding (Appendix S3). The coding framework was based on Grol and Wensing's implementation of change model.[27] One researcher (MS) coded thematically using the coding framework and applied open coding to the transcriptions under the supervision of another researcher (MH-S.). The codes were tabulated and described in categories with themes and illustrative quotes.

The interviews were thematically analysed using the qualitative data analysis software ATLAS.ti 8.4.20.[28,29] Data collection and analyses of the interviews were performed according to the Consolidated criteria for reporting qualitative studies (COREQ) checklist (Appendix S4).[30]

3 | RESULTS

3.1 | Response rate and respondent characteristics

In 2014, the response for the TCI and of the evaluation questionnaire was 17.6% (121/687) and 17.7% (123/695), respectively. In 2016, the response for both questionnaires was 28.6% (107/374) and in 2019 it was 25.0% (150/600). Approximately 50% of the respondents in 2014, 2016 and 2019 were surgeons (including residents and fellows) (Appendix S5). Of the interviewees, the years of experience in the current function were 2-32 years. Fifty-four percent of the interviewees were male. Detailed characteristics of the interviewees are presented in Appendix S6.

3.2 | Effects on team climate of surgical teams

Nearly all TCI scores increased in 2016 and 2019 in comparison with 2014 (Table 1). Only the dimension "participative safety" increased significantly 5 years after the implementation of perioperative briefing and debriefing (*P* = .02) (5.21; 95% confidence interval (CI) 1.18-9.25). The respective p-values of the dimensions "support for innovation," "vision" and "task orientation" were 0.25 (0.91; 95% CI −0.72 to 2.54), 0.93 (−0.07; 95% CI −1.77 to 1.6) and 0.96 (0.03; 95% CI −1.41 to 1.46).

3.3 | Experiences of surgical team members with perioperative briefing and debriefing

In general, surgical team members were positive towards perioperative briefing and debriefing (Figure 1). However, the percentages of (strong) agreement decreased for six of seven items from 2014 to 2019. In 2019, 81.1% of team members indicated that perioperative

TABLE 1 Percentage TCI scores (SD) in 2014, 2016 and 2019 of the included surgical teams

	2014 (n = 123; 5 surgical teams)	2016 (n = 107; 5 surgical teams)	2019 (n = 153; 13 surgical teams)
TCI dimension			
Participative safety	71.8 (11.3)	74.7 (9.5)↑	77.5 (10.7)↑[*]
Support for innovation	69.1 (11.8)	69.3 (12.1) ↑	72.0 (12.3)↑
Vision	71.5 (12.6)	73.5 (13.5)↑	71.4 (14.7)~
Task orientation	73.9 (12.6)	69.9 (12.6)↓	74.8 (13.7)↑
Total TCI score	71.6 (10.4)	71.8 (9.8)↑	74.0 (10.4)↑

Abbreviations: ~, almost equal % in comparison with baseline; ↑, increased %; ↓, decreased %; SD, standard deviation; TCI, Team Climate Inventory.
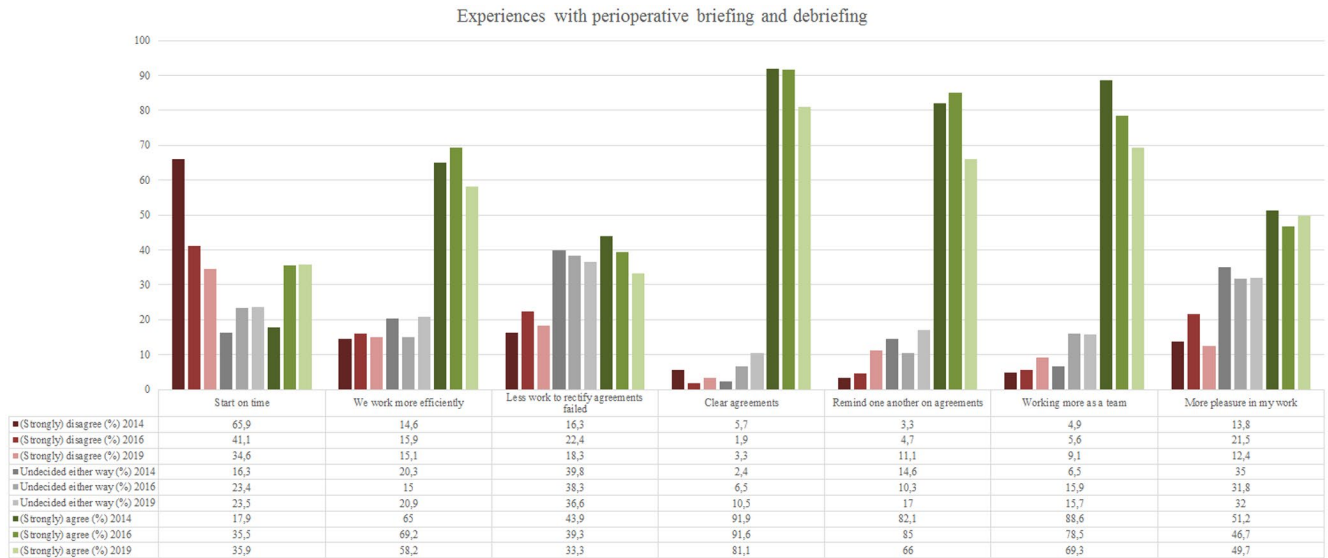*$P < .05$.

	Start on time	We work more efficiently	Less work to rectify agreements failed	Clear agreements	Remind one another on agreements	Working more as a team	More pleasure in my work
■ (Strongly) disagree (%) 2014	65,9	14,6	16,3	5,7	3,3	4,9	13,8
■ (Strongly) disagree (%) 2016	41,1	15,9	22,4	1,9	4,7	5,6	21,5
■ (Strongly) disagree (%) 2019	34,6	15,1	18,3	3,3	11,1	9,1	12,4
■ Undecided either way (%) 2014	16,3	20,3	39,8	2,4	14,6	6,5	35
■ Undecided either way (%) 2016	23,4	15	38,3	6,5	10,3	15,9	31,8
■ Undecided either way (%) 2019	23,5	20,9	36,6	10,5	17	15,7	32
■ (Strongly) agree (%) 2014	17,9	65	43,9	91,9	82,1	88,6	51,2
■ (Strongly) agree (%) 2016	35,5	69,2	39,3	91,6	85	78,5	46,7
■ (Strongly) agree (%) 2019	35,9	58,2	33,3	81,1	66	69,3	49,7

FIGURE 1 Experiences with perioperative briefing and debriefing in 2014 (N = 123), 2016 (N = 107) and 2019 (N = 150)

TABLE 2 Top three positive and negative experiences with perioperative briefing and debriefing in 2019

	Briefing		Debriefing	
	+	−	+	−
1	Discuss course of the day, including potential issues	Irrelevant questions on the briefing card	Create an opportunity for feedback	Team incomplete at the end of the day (anaesthetic assistant to recovery/surgeon to the ward)
2	Express each other's responsibilities	Staff members too late in the morning/incomplete team	Create learning goals	Staff does not prioritise debriefing/does not see additional value
3	Express expectations of the programme	Inefficient when team composition changes during the day		No control of compliance of learning goals or improvement actions

briefing and debriefing made agreements of the day clear, 69.3% felt that the instrument enabled them to work as a team and 66% indicated that perioperative briefing and debriefing ensured that they reminded each other about agreements. The lowest percentages of (strong) agreement were for the items "less work to rectify agreements failed" (33.3%), "start on time" (35.9%) and "more pleasure in my work" (49.7%), although the scores of the last two items improved slightly in 2019 compared with that in 2016. Compared with 2014, only "start on time" showed improvement in the score for (strong) agreement.

The most prominent reported strengths of briefing and debriefing were related to discussing the course of the day and the opportunity for giving feedback to improve their daily surgical work (Table 2). An important limitation was that surgical teams are often incomplete during briefing and debriefing because of poor timing or lack of sense of urgency.

3.4 | Perceived barriers and facilitators on the performance of perioperative briefing and debriefing

In total, the interviewees brought up 25 barriers and facilitators: 14 barriers and 10 facilitators, of which one was also a barrier (Table 3).

Most barriers were related to debriefing (n = 10) and most facilitators were related to briefing (n = 6). We divided the barriers and facilitators into four categories: innovation, professional, social context and organisational context.

The barriers were mainly categorised into organisational (n = 6) and social context (n = 3). The prominent organisational barriers were: lack of dedicated teams, incomplete team, no follow-up of learning goals and lack of control of improvement actions. Barriers to briefing were related to innovation (n = 3), eg, irrelevant questions and lack of personal interest. The often mentioned professional-related barriers to debriefing were: absence of a safe culture for (negative) feedback, lack of culture of accountability and lack of priority by healthcare professionals.

Facilitators were related to all categories. The important facilitators for briefing were: the feeling that discussing the surgical programme, including potential difficult situations, at the beginning of the day fosters efficiency and helps maintain good work flow. The important facilitators for debriefing were the opportunity to give positive feedback and to discuss complications or concerns regarding surgery.

Despite all the barriers, all interviewees acknowledged the added value of both briefing and debriefing and their positive influence on

TABLE 3 Perceived barriers and facilitators by the interviewees

Category	Factor	F	B	Illustrative quotes	BR	DB
Innovation	Introduction round of team members	✓	✓	Anaesthetic technician: 'The introduction round is very nice. Sometimes, there are a lot of people in the OR.' Resident anaesthesiologist: 'What is very useful, is the introduction round because OR staff often changes.' ORTHO surgeon: 'I believe that the introduction round is very important. There are a lot of people who do not agree with me on this [...] but I find it very important.' Anaesthetic technician: 'The introduction round is not always applicable.'	✓	
	Not all questions are relevant (briefing card)		✓	Resident OMF surgeon: '[...] Then I think, hygiene agreements, does that really belong in a briefing?'	✓	
	Lack of personal interest		✓	Gynaecologist: 'You should not ask: What did not go well? You should ask it like: "Are there any personal things that you bumped into? [...] Make it more personal.'	✓	
	Timing		✓	ORTHO surgeon: 'Debriefing while the patient wakes up is very inconvenient. [...] Anaesthetic assistants do not come back and OR assistants want to clean the OR as fast as possible.'		✓
	Anticipate medical devices and resources	✓		OR assistant: '[...] because it is also a check for all the medical resources and technical instruments.'	✓	
		✓		General surgeon: 'Sometimes, technical issues with medical devices come to light in the debriefing and who will take care of it. That is quite relevant, so when the anticoagulant machine does not function properly, who takes care of it? Who writes the e-mail? When there were problems, then it is very useful.'		✓
Professional	Sense of urgency by lack of complication		✓	OR assistant: 'The patients are done, we have worked alright and there were no debates. It is fine. So then, I don't feel the urge to discuss anything.'		✓
	Sharing concerns regarding complexity of surgery or complications	✓		OR assistant: 'When the patient is not alright after the surgery, it feels good to talk about it with your colleagues about what happened and what we could have done better.'		✓
	Lack of awareness of potential benefits		✓	Anaesthetic assistant: 'People do not see the benefits or usefulness of debriefing if no complications occurred.'		✓
	Anticipate difficult situations	✓		Anaesthesiologist: 'The briefing is a good instrument to investigate who is in the team, what is on the planning, to make agreements on who is going to do what and just to look each other in the eyes.'	✓	
Social context	Atmosphere	✓		OMF resident: 'There is a positive atmosphere in the OR.' Anaesthetic technician: 'Team climate is very nice [...]. I work with very easy and normal people.'	✓	
	Setting expectations	✓		Anaesthetic technician: 'It takes away irritations. If you, as a surgeon, mention that you are not sure what you will encounter once you open up the patient, then people will not be surprised when the surgery takes a bit longer.'	✓	
	No safe culture for feedback		✓	Neurosurgeon: 'Of course, giving positive feedback is nice; you can do that in the team. However, when I am disappointed about something [...] then people feel personally attacked.'		✓
	Lack of priority		✓	Neurosurgeon: 'People see the need but do not prioritise debriefing. They know that it could help them, but when they think about it. What costs more work? Going home and leave it or begin the discussion and be reminded of it every time you see that person in the OR.'		✓
	Absence of culture of accountability		✓	Neurosurgeon: 'I find it worthless, really, debriefing is never done. The point is, what we've said earlier, there is no culture of accountability.'		✓
	Positive feedback	✓		Anaesthetic assistant: 'It is also nice to hear from your team when the day went well.'		✓

TABLE 3 (Continued)

Category	Factor	F	B	Illustrative quotes	BR	DB
Organisational context	Efficiency	✓		ORTHO surgeon: '[...] It is very useful and increases efficiency.'	✓	
	(Lack of) dedicated teams		✓	ENT surgeon: 'The briefing will never replace a dedicated team. [...] You cannot say that when you discuss the day thoroughly that everything goes fine. [...] You will never become a champion when you perform a surgery 40 times with 40 different teams.'		✓
		✓		Gynaecologist: 'I believe that when you know each other well, it is easier to hold each other accountable and give feedback.'	✓	
	Changes in team composition		✓	OR assistant: 'It is difficult when there is another surgeon in the afternoon. Then we can only discuss the first surgery.'	✓	
	Incomplete team		✓	ENT surgeon: 'Many staff members are late meaning that the briefing starts too late. It takes a lot of OR time away.'	✓	
			✓	General surgeon: 'You cannot gather people at the end of the day. One person is transferring the patient to another the bed, the other is busy with medication. [...] It does not work at the end of the day.'		✓
	No follow-up of learning goals		✓	ENT surgeon: 'Suppose that we have a conversation about what went well and what could be improved. We both extract our learning goals, but then we will not see each other for the following 50 surgeries; well then I think, what use is it?'		✓
	Lack of control on improvement actions		✓	ENT surgeon: 'I also don't know what happens with the things we discuss in the debriefing. When someone takes responsibility to fix something, how do we know that it happens? We don't.'		✓

Abbreviations: B, barrier; BR, briefing; DB, debriefing; F, facilitator.

team climate. None of the interviewees suggested that either briefing or debriefing should be abolished. All interviewees provided suggestions for improvement (Table 4). Four were related to debriefing only, three to briefing only and three to both briefing and debriefing. Most of the suggestions (6/14) were related to innovation (eg, timing and place, asking more specific and relevant questions), two were related to organisational factors (eg, creating a reward system) and three to social context (eg, more attention to role models and constructive feedback).

According to the interviewees, giving constructive feedback is beneficial for team climate and professional learning. However, they also acknowledged that they would rather not provide such feedback during debriefing with the whole team, despite the fact that this is a key element of debriefing. They would either ignore it or try to discuss it face-to-face. Anaesthesiologists and surgeons should act as role models when giving feedback within teams. The interviewees were unable to present solutions for creating a safer culture for providing feedback.

4 | DISCUSSION

This study shows that surgical team members confirmed that perioperative briefing and debriefing have a significant influence on the participative safety of team climate 5 years after implementation. Surgical team members agreed that briefing and debriefing should be maintained. Briefing clarifies agreements of the day and ensures that team members remind each other of agreements. Furthermore, the instrument enables them to work as a team. The long-term

evaluation of surgical safety tools has been shown to be meaningful: a number of barriers and facilitators were mentioned and can be used to improve the surgical safety tools.

Perioperative briefing and debriefing have less influence on efficiency. Surgical team members reported that this intervention had less influence on work to rectify agreements, starting on time and work pleasure. The team members explicitly mentioned that incomplete teams at both the start and end of the day prevented both briefing and debriefing from being efficient. This is also in accordance with the lower scores of (strong) agreement for the item "start on time" in the evaluation questionnaire.

The team members expressed a more negative attitude towards debriefing compared with briefing, mainly because of suboptimal performance. This can be attributed to the fact that team members do not see the added value of debriefing because of the fact that the proposed improvement actions are barely implemented and their experienced lack of safety for giving (constructive) feedback. This result is somewhat surprising given the fact that the TCI scores for participative safety increased significantly in 2019 compared with baseline ($P < .05$). This significant increase in participative safety means that team members feel safe sharing information in their team. It seems that team members only feel safe sharing technical information rather than personal issues. Another explanation could be that there is less culture of learning from the aspects that did not work very well that day. The lack of a learning culture for improving patient safety in the OR could also explain the result that overall team climate scores did not increase significantly 5 years after implementation. Alternatively, the surgical team members do not sufficiently recognise what perioperative briefing and debriefing have delivered and this has now become the new reality.

TABLE 4 Suggested improvements for perioperative briefings and debriefing by the interviewees

Category	Improvement suggestion	Illustrative quotes	BR	DB
Innovation	Inform the team members about their personal circumstances	Neurosurgeon: 'You should ask how everyone is doing for that day. [...] The only two important aspects are: 1) is the team fit enough and 2) are there any special cases on the programme. [...] People find the fit to fly question confrontational but it is actually very important to know when one of your colleague's grandma is dying.'	✓	
	Ask more specific questions	Gynaecologist: 'Questions are asked in a general way, resulting in general answers. You should not ask: "What went well?". You should ask: "Did we bump into any organisational things?"'		✓
	Ask relevant questions	Gynaecologist: 'The question regarding team learning goals does not have additional value. However, you could phrase it more like: "is there anyone with specific learning goals for which the rest of the team should give some more space?" It is not a shared learning goals for the whole team, but if a residents want to learn to intubate, this takes time. If you mention this, everyone can take this into account.'	✓	
	Express each other's responsibility	Anaesthetic technician: 'If the goal is to improve teamwork, you should also ask: "who is responsible for what?".[...] Now, we just mention what we need but after that, everyone just stands there like "eeh, yeah".'	✓	✓
	Improve timing and place of *briefing*	Resident OMF surgeon: 'Sometimes, the briefing starts when the first patient is already present in the OR. As a result, we do the briefing in the hallway and one of the team members stays inside with the patient. This is not optimal.' Anaesthetic assistant: 'Briefing often takes place in the hallway, but such information should not be exchanged in the hallway where patients come through.'	✓	
	Improve timing and place of *debriefing*	ORTHO surgeon: 'I would recommend that debriefing takes place after each procedure, just very shortly. Just state; how is the team doing?, how did this procedure go? And not at the end of the day when for example the anaesthetic assistant is away bringing the patient to recovery.'		✓
Social context	Role model	Anaesthesiologist: 'Exemplary behaviour should come from anaesthesiologists and surgeons. They should express vulnerability. Ultimately, the others will follow.' Neurosurgeon: 'There are still a lot of egocentric persons. Egos should leave. Besides, we show exemplary behaviour. If we express ego, residents copy that. We, as teachers, should express vulnerability.'		✓
	Constructive feedback	Anaesthesiologist: 'I would say at the end of the day. Well, we have done a lot today. Let's write something down that went well and something that we can work on. [...] Say that we on average do 15 surgeries per day. That would mean that we would end up with 15 positive as well as 15 improvement actions.'		✓
		General surgeon: 'You should definitely also mention the positive aspects of the day.'		✓
Organisational context	Reward system	ORTHO surgeon: 'People are not rewarded for being done in time. [...] It does not matter what you do. You are done on Friday afternoon at 4.00 PM, that is set. A little more reward for being ready on time, would increase efficiency.'	✓	✓
	Involving team members	Gynaecologist: 'I am sorry that the perioperative briefing and debriefing list is introduced at some point; just boom. There it is. Someone introduces it. But what you should do is make three of these lists with different items and then introduce them in different teams. After that, you can evaluate which one of the lists fits the best.'	✓	✓

Abbreviations: BR, briefing, DB, debriefing.

A number of the barriers of briefing and debriefing identified in this study were in accordance with Fruhen et al,[17] for example, incomplete staffing, negative attitudes towards debriefing and having different surgeons throughout the day. However, the same study also mentioned that a lack of knowledge about briefings hindered performance.[17] We did not find such a barrier, which shows that perioperative briefing and debriefing are well-integrated in our hospital. A prominent barrier to debriefing we identified was the lack of safe culture for giving feedback. The interviewees mentioned that they did not feel comfortable giving (constructive) feedback in the group. This is also in accordance with Nathwani et al,[31] who reported

that surgical staff members highly valued postoperative feedback but also mentioned barriers to giving postoperative feedback such as lack of time and discomfort with giving feedback.[31] These barriers were also mentioned by our interviewees.

A strength of this study is that we measured the effect of perioperative briefing and debriefing 5 years after implementation and showed that even well-integrated patient safety intervention can be further improved. Furthermore, we used a mixed-method approach, which included a validated questionnaire to study team climate (the TCI),[20,21,23] a short evaluation questionnaire survey[16] and in-depth interviews to gain insight into experiences with perioperative (de)

briefing. A mixed-method approach is particularly appropriate for evaluating patient safety interventions.[32] Combining the evaluation questionnaire and individual interviews enhanced the reliability of the findings. The in-depth interviews contributed to the knowledge of resistance towards perioperative (de)briefing and how this can be improved.[28,29,33,34] The TCI is able to identify the effects of interventions over time and has discrimination capacity.[20] Another strength of our study is the purposive sampling of interviewees in terms of job function and years of experience for maximising diversity.

Several limitations have to be taken into account. First, we included eight teams in 2019 vs five in both 2014 and 2016. The differences in the number of teams could have influenced the TCI scores. However, we included the additional teams reflecting all surgical specialties because perioperative briefing and debriefing were integrated into all surgical teams. Furthermore, we believe that the experiences of the added teams are valuable for understanding the performance of perioperative briefing and debriefing. Another limitation is that we did not measure patient safety outcomes, eg, adverse events. The relation between perioperative briefing and debriefing and patients safety remains uncertain and was beyond the scope of the present study. We also did not include an outcome measure for efficiency, eg, difference between planned and realised operative time. The response rate of the TCI in 2019 was just 25%. This appears to be a low response rate; however, low response rates amongst healthcare professionals are not uncommon.yy[16,35,36] It remains unclear whether non-responders have a highly different attitude towards team climate. Another point of uncertainty is the fact that the interviewees were mostly positive towards perioperative briefing and debriefing. This might have resulted in selection bias, as surgical staff members with negative attitudes towards this patient safety intervention might have been unwilling to cooperate in the interview evaluation. A methodological point of concern is the fact that we did not take into account possible unknown confounders, eg, different roles within the team and intermediate factors that could also have had an influence on the association between perioperative briefing and debriefing and perceived participative safety of surgical teams. For example, it might be assumed that a well-integrated briefing and debriefing structure increases expectation management, which in turn influences team climate positively. After all, expectation management enables team members to anticipate crucial moments during surgery. This could have influenced the TCI scores but was beyond the scope of this study. Not all team members work in dedicated teams only, which renders the TCI a less applicable questionnaire. This might have influenced the representativeness of the results. Finally, we assume that perioperative briefing and debriefing has more benefits on working as a team in a tertiary care university hospital compared with a non-university hospital or an ambulatory surgery centre. In a tertiary care university hospital more high-complex and low-frequent procedures are delivered which requires more team coordination and cooperation. Besides, in a tertiary care university hospital, the team composition continuously changes, whereas in a non-university hospital or an ambulatory surgery centre surgical teams work together in more fixed teams.

5 | CONCLUSIONS

Although surgical staff members are resistant towards patient safety interventions that are perceived as administrative burdens, our study shows that perioperative briefing and debriefing, as a non-administrative tool, are considered a useful method for improving and sustaining participative safety and cooperation within surgical teams. It leads to more team working and clear daily work agreements. However, perioperative briefing and debriefing will become more effective for maintaining team climate when teams are complete, irrelevant questions are substituted by specific and customised ones and when there is a safer culture for feedback. Future studies could investigate if the intervention can be tailored to each surgical team or type of surgical procedure, as we may imagine that a high-frequent, non-complex surgical procedure may not need the same briefing and debriefing approach as a complex one. Evaluating surgical safety interventions 5 years after implementation is still relevant and helps when tailoring surgical safety tools.

AUTHOR'S CONTRIBUTIONS
MS and MH-S led the writing of the first draft and revised this manuscript. TM conceived the design of the study. MH and MH-S collected the data, analysed and interpreted the data. JM and AH contributed to the critical revision of the manuscript. All authors approved the version of the manuscript for publication.

ETHICS
The study has been carried out in the Netherlands in accordance with the applicable rules concerning ethical review and informed consent. No patients were involved in this study.

DATA AVAILABILITY STATEMENT
No additional data are available.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.