REVIEW ARTICLE

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Short-term risk assessment in the long term: A scoping review and meta-analysis of the Brøset Violence Checklist

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Accessible Summary

What Is Known on the Subject?

- The Brøset Violence Checklist (BVC) has been widely translated and implemented in diverse mental healthcare settings to improve prevention of violence.
- It is valued as a brief but effective tool in clinical practice.

What the Paper Adds to Existing Knowledge?

- This review is the largest and most comprehensive international review of the BVC conducted in the 25+years since the inception of the instrument in 1995. It integrates findings from existing studies and establishes that the tool has many impressive strengths considering the brief time investment required for completion.
- The review reveals that the tool has been used in more than 20 different countries around the world in a variety of mental health and other settings as both a risk assessment tool to guide clinical practice and as a formally structured intervention to minimize violence.
- There is much variation in how the tool is implemented and scored in different services. This variation questions its applicability as a resource and consistency and its use needs attention. This variation in use also limits the conclusions regarding best practices.

What Are the Implications for Practice?

- The review supports the use of the BVC as one part of the package for mental health services committed to preventive action aimed at reducing violence and coercion.
- The review identified that the patient perspective was often absent when completing the BVC, and so this should be considered as an option by services as part of a collaborative philosophy of care.

Abstract

Introduction: Existing literature on the Brøset Violence Checklist (BVC) is examined in the context of usability, implementation and validity to provide evidence-based recommendations on its application and identify opportunities for future development.

Aim/Question: To identify current knowledge on the BVC and guide clinicians and researchers toward the next steps in using this tool in clinical practice to prevent violence in healthcare settings.

Method: A scoping review approach with a meta-analysis supplement was adopted to broadly identify and map available evidence on the BVC and provide specific estimates of predictive validity in different contexts.

Results: Sixty-two studies conducted in 23 countries addressed the implementation of the BVC across various settings. Many studies adapted the original BVC, and the clinical utility was noted as an important feature. A meta-analysis of the original BVC format estimated a pooled area under the curve at 0.83 (95% CI 0.78–0.87) in a subset of 15 studies.

Discussion: The BVC combines high predictive validity and good clinical utility across a wide range of settings and cultures. It should continue to be incorporated into routine practice in mental health services focused on preventing violence and coercion.

Implications for practice: Development of collaborative approaches with service users involved in assessing their own risk of future violence.

KEYWORDS

checklist, mental health, psychiatry, risk assessment, violence

1 | INTRODUCTION

Violence against health workers is a widespread problem worldwide and is reportedly on the rise (Cooper & Swanson, 2002; Vento et al., 2020). A cross-sectional survey by Babiarczyk et al. (2020) reports data from 1089 nurses in five European countries (Poland, the Czech Republic, the Slovak Republic, Turkey, and Spain) and shows that 54% stated that they had been exposed to non-physical violence in the workplace, 20% had experienced physical violence, and 15% had suffered both forms of violence. A systematic review and meta-analysis by Li et al. (2020) also reported a high prevalence of workplace physical violence perpetrated by patients and visitors against healthcare professionals. Pooled data show that annually one in five healthcare professionals worldwide experienced workplace physical violence committed by patients or visitors. The study revealed regional differences with a slightly higher reported incidence of workplace violence in Europe compared to other World Health Organization regions (Li et al., 2020). Andersen and Christensen (2019) found that females are at a higher risk of workplace violence compared to males (rates of 34% for females and 25% for males, adjusted for proportions in the workforce), and a recent systematic review by Odes et al. (2021) focused on inpatient psychiatric settings in the United States (US) showed that between 25% and 85% survey respondents reported an incident of physical aggression within a year prior to the survey.

Taken together, these studies show that workplace physical violence is a widespread problem for workers in healthcare settings worldwide, and therefore, efforts must be made to reduce and prevent this serious problem. Structured risk assessment is often recommended as a method for assessing the risk of future violence and is often incorporated into clinical guidelines to improve staff capacity to prevent aggressive or violent patient behaviour toward others (Hauge et al., 2021; National Collaborating Centre for Mental Health (UK), 2015) and the consequent need for coercion. This recommendation to use risk assessment is proposed for two interrelated reasons: it is perceived as the best practice when caring for patients and helps to prevent violence toward staff (Dickens et al., 2020). Several structured risk assessment tools have been developed and tested (Desmarais et al., 2021), but only a few evidence-based recommendations have been repeatedly made in national clinical guidelines (e.g. the National Collaborating Centre for Mental Health (UK), 2015). One of these is the Brøset Violence Checklist (BVC), a tool which is highly recommended as it combines user-friendliness, ease of implementation and acceptable predictive validity for predicting imminent violence in mental healthcare settings (Dickens et al., 2020). This review summarizes current knowledge on key aspects of the BVC and recommends next steps for successfully using this tool in clinical practice worldwide to prevent violence and coercion.

The BVC was developed in Norway (Almvik et al., 2000; Almvik & Woods, 1998; Woods & Almvik, 2002) from the empirical work of Linaker and Busch-Iversen (1995) over a 5-year period in a high-secure mental health setting. These initial authors found that the nursing staff most frequently recorded six forms of behaviour (confusion, irritability, boisterousness, physical threats, verbal threats, and attacks on objects) in their daily reports in the 24-h period prior to a violent incident happening. The BVC guides healthcare staff in assessing the presence or absence of these six behaviours, and

the checklist is generally completed two or three times over a 24-h period. Two systematic reviews have been conducted over the past 15 years focused specifically on the predictive validity of the BVC (Anderson & Jenson, 2018; Dickens et al., 2020). This narrow emphasis on a single feature, even though important, needs contextualization by consideration of other practical aspects of how the instrument is used in clinical practice. It is documented (Abderhalden et al., 2004; Almvik et al., 2000; Hvidhjelm et al., 2014) that the BVC can predict aggressive behaviour, but based on dialogue with and feedback from health professionals and researchers, it is our experience that there is a need for guidance as well on the implementation and use of BVC. In our investigation of existing knowledge on the BVC, we realized a clear absence of research and knowledge on this implementation aspect. The BVC is used worldwide, but to the best of our knowledge, no studies have identified or mapped these implementation gaps. The scoping review reported here, therefore, aims to examine the available literature on the BVC to better understand its usability and how it is implemented to provide broader evidence-based recommendations and identify opportunities for the future.

In addition, since proven efficacy is an aspect of successful implementation (Lantta et al., 2016) and since the scoping review used a systematic search strategy, it was considered beneficial to conduct an additional meta-analysis of predictive validity on a predefined subset of included studies to supplement and update the most recent reviews which have been focused on the use of the BVC and other tools in specific forensic populations (e.g. Ramesh et al., 2018). This combination of a scoping review and meta-analysis (Plana et al., 2014) enables a more complete summary of the current state-of-the-art in BVC implementation than can be achieved by either methodology alone.

Overall, this review aimed to identify current knowledge on the BVC and guide clinicians and researchers toward the next steps in using this tool by addressing the following research questions:

1. Where and how is the BVC being used?
2. How is the BVC implemented in practice?
3. What is the predictive validity of the BVC?

2 | METHOD

2.1 | Scoping review

We adopted the scoping review methodology (Peters et al., 2020) as this type of review is appropriate to synthesize diverse type of evidence that underpins healthcare innovations, such as the BVC. We followed the six-stage procedure of Arksey and O'Malley (2005) for a scoping review: (1) formulating the research question(s); (2) identifying relevant studies; (3) selecting studies; (4) mapping data; (5) collating, summarizing and reporting the results; and (6) consulting with stakeholders. We commenced with a preliminary consultation exercise involving stakeholders (Buus et al., 2022) in order to ensure that the aims of the study reflected the needs of clinicians. The

selected stakeholders were mental health nurses ($n = 13$) from two forensic in-patient services in Denmark. They had in-depth knowledge about the topic and were experienced in using the BVC, and they were invited to raise practical questions that concerned them (Arksey & O'Malley, 2005). The stakeholders thus contributed to the initial formulation of the research questions (see Section 2.1.1), the study inclusion criteria (see Section 2.1.2) and the specific items for extraction that were applied to each included study (Section 2.1.4 below). The authors then finalized these aspects prior to the commencement of the literature search.

2.1.1 | Formulation of research questions

The research questions related to how the BVC is being used currently and how it is being implemented into practice (Q1 and Q2) and were formulated based on the combined practical and research knowledge of both the stakeholders and the authors.

2.1.2 | Identification of relevant studies

In February 2021, a systematic literature search was conducted, supported by a research librarian, on the following databases: CINAHL, Embase, Medline, PsycINFO, ERIC, Google Scholar, Clinical trials, Cochrane Library, Web of Science and WorldCat. The very broad search strategy was formed by the authors based on information from prior studies with the free-text terms: "Brøset," "Broset," "BVC," OR "Brø(o)set Violence Checklist." This broad search was designed to ensure that the widest range of potentially relevant studies was captured including those in areas outside the healthcare system if relevant.

Eligibility criteria
Studies were included if they met the inclusion and exclusion criteria presented in Table 1.

2.1.3 | Selecting studies

The search results were exported into Covidence (covidence.org), and duplicates were removed. Covidence was chosen as the reference management program to make the process of inclusion and exclusion more transparent and to increase the review's reliability. To identify eligible studies, all authors worked independently in pairs across two stages: first, screening of titles and abstracts of all identified studies and then full-text screening of studies meeting the eligibility criteria. There was no exclusion of studies based on language. If none of the authors was competent in a relevant language, we made an automated translation using Google Translate and consulted experts from origin countries to clarify results from the paper where possible. If there was any disagreement about inclusion, the article was discussed with a third author until consensus

TABLE 1 Inclusion and exclusion criteria.

Inclusion	Exclusion
• Published 1995 or after • Includes the words Brøset, Broset, BVC or Brø(o)set Violence Checklist • Includes modified versions • More than just a description/statement of the properties of BVC or previous research • Can be a description of use within practice in any way (within and beyond psychiatry) • Any country • Any language • Any publication format (book chapter, conference abstract, poster, report, guideline, thesis etc.)	• Thesis with articles published • Conference paper linked to a full article • Editorial (part of an article already included) • Not available • Policy paper • BVC just mentioned • No BVC data reported • Reviews existing BVC data only

was reached. There was no quality assessment of included studies in accordance with the principles of a scoping review (Peters et al., 2020). Following this procedure, a total of 62 empirical studies were included in the review, and the study selection process is summarized in Figure 1 in a PRISMA flow chart.

2.1.4 | Mapping data

Data were extracted by pairs of authors for the included studies into an Excel spreadsheet with 36 fields derived from Step 2.1. The main field domains were as follows: study characteristics; usability (e.g. country, context, population); and implementation practices (e.g. version of BVC, assessment, clinical utility). Some fields were pre-structured requiring either numerical data (e.g. sample size) or choice from a predefined menu of options (e.g. ward type) but others (e.g. ethical issues) required free textual data that were copied and pasted into the spreadsheet. See a detailed description of the data extracted in Table 2. Any discrepancies between extractors were resolved through discussions among the team members.

2.1.5 | Collating, summarizing and reporting results

An overview of the included studies is provided in Supplement A with the study reference number cited in square brackets in the results below, e.g. Almvik et al. (2000) are identified as [4]. To address the first two research questions based on the full set of 62 studies identified in the scoping review, we summarized numerical data and subjected the textual data to a narrative description.

2.2 | Meta-analysis

The third research question on predictive validity was addressed by conducting a meta-analysis (MA; Shorten & Shorten, 2013). Each of

the 62 studies systematically identified by the scoping review was subjected to further screening against additional criteria. Studies were included in the MA subset if they reported (1) an area under the curve (AUC) statistic with confidence intervals; (2) for the BVC in its original 6-item format with (3) violence as an outcome. When multiple AUCs were reported in a study, a single AUC was selected for analysis with preference given to the AUC that represented (4) the total sample (rather than subsamples) and/or (5) the longest timeframe from BVC completion to violence outcome. Fifteen studies fulfilled these criteria and provided an AUC for the analysis (see Figure 1). The AUC values were extracted independently by a pair of authors, and any disagreements were resolved through discussion between them. A pooled AUC estimate with 95% confidence intervals from all 15 studies was calculated using MedCalc (version 19.8) statistical software together with subgroup analyses (Europe vs. non-European setting; nurse vs. non-nurse rater).

3 | RESULTS

### 3.1 | Study characteristics (*n* = 62 studies)

Most studies were designed and analysed quantitatively (*n* = 56, 90%) with only six studies (10%) that predominantly used qualitative methods. The quantitative studies often aimed at validation of the BVC or were an effort to explore associations of the BVC score with, for example, seclusion or patient symptoms behaviours. The qualitative studies often aimed at exploring the usefulness of the BVC from the perspective of the healthcare professionals.

3.1.1 | Usability

This has been defined below in terms of the country where the study was conducted, the type of setting, the study population and the languages into which the BVC has been formally translated.

Country: The studies were conducted in 23 different countries with more than half (*n* = 36, 58%) undertaken in Europe. Overall, the countries with the most studies were Norway (*n* = 12, 20%), the Netherlands (*n* = 7, 11%), the United States (*n* = 6, 10%), China and Canada (*n* = 4, 7% each). *Setting*: Nearly half of the studies were conducted in psychiatric intensive care units (PICUs) or adult acute or closed wards (*n* = 27, 44%). Other settings included emergency departments (*n* = 5, 8%), child and adolescent services (*n* = 5, 8%), forensic wards (*n* = 4, 6%), elderly services (*n* = 2, 3%) and outreach services (*n* = 2, 3%). One study each was conducted in a general hospital [48], a church [10] and a mandatory alcohol treatment unit [37]. Several studies did not report a ward type (*n* = 13, 21%), and some studies included multiple types of wards (e.g. [4, 33, 52, 58]). *Population*: 47 studies (76%) reported the patient sample gender distribution. Based on these reports, the median proportion of female patients across samples was 44.7% (interquartile range (IQR) 11.0%). The average age of

FIGURE 1 The PRISMA flow chart of the literature search.
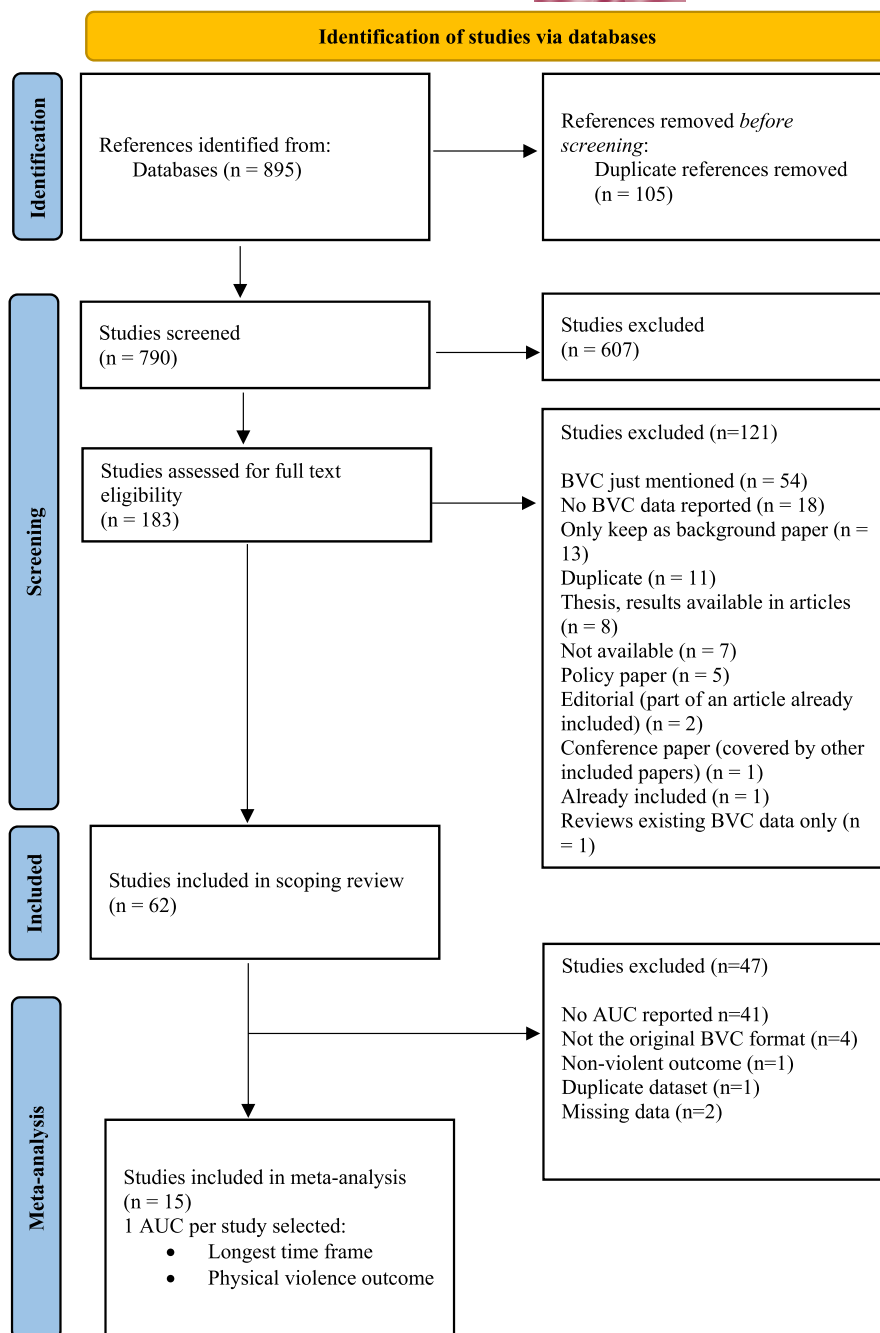
the participating patients was reported in 34 studies (55%) with a combined median of 39.95 years (IQR 6.5 years). In 42 studies (68%), a diagnosis for the patient population was specified but no studies focused on one or more specific diagnosis. *Languages*: The BVC has been translated into 16 different languages, and some of these translations have been based on a formal procedure with back translation and permission from the last author here (RA). The tool has been formally translated into English [58], Danish [19], Chinese [60], Dutch, French, German [1], Polish [48], Portuguese [15], Russian, Swedish [37], Turkish [34], Japanese [45], Finnish [54], Czech [35], Sinhalese (the national language of Sri Lanka) [44], Swiss German [3] and Italian [49].

3.1.2 | Implementation practices

We examined various aspects of practical implementation of the BVC in these settings.

Version: Most studies (*n* = 52, 84%) used the original six-item version of the BVC as initially formulated by Linaker and Busch-Iversen ([1995](#)). The remaining 10 studies had altered the original version in some way by adding or removing items, with nine adding either one or two items for various purposes. Some additional items were intended to enhance the original BVC's risk assessment capability by expanding the range of potentially relevant behaviours These included "history of violent attacks" [22], "response

TABLE 2 Overview of the data extracted.

How is BVC being used in different settings, populations and countries?	• Version of the BVC (BVC-VAS, east-London modified BVC, BVC) (describe the extension) • Have there been added items to the BVC? • Number of added items • In what countries is BVC being used • How often do they register the BVC? • Electronic or paper version • What profession scores on BVC • In what settings is BVC being used • Just risk assessment or risk assessment+(is it being used to more than designed for) • How was training provided • Description of user-friendliness/compliance • Diagnoses • How do they record the response (VAS, score or?) • Implementations issues (how is it implemented) • Is the BVC score used internally (in-house) or externally (e.g. Courts) for decision-making • Languages • Specialties • Type of Interventions (preventive measures) • Ward type (closed/open/High/medium/low)
What is the future of BVC?	• Future research (future research questions raised) • Recommendations (e.g. Training, setting (we did not do this – you do this))
What is the predictive validity?	• The effect of using BVC

to de-escalation" [30], "PRN compliance" [30], "sleep disturbance" [25], "chaotic behaviour" [22], "self-perception of risk" [27] and "previous and current threats (verbal/physical)," which is item 2 from the V-Risk-10 [27] (Roaldset et al., 2011). In three studies by two different research teams, a Visual Analogue Scale (VAS) [2, 3, 40] was added to the six-category behaviour checklist for recording the perceptions of an overall risk about a physical attack within the next 12-h on a continuous scale from 0 to 100. Additional information beyond risk behaviours and perceptions was gathered in five other studies, including several studies which provided a checklist of interventions used by staff in response to a high BVC risk score [8, 24, 41, 48, 50]. One study removed the "boisterous" item from the original version without any explicit justification [35]. Some of these altered versions were given new names: the East London Modified-Broset [30], BVC-VAS [2], BVC-German [1], and BVC-Extended [22]. *Timing of assessment*: In 12 studies (19%), the staff conducted an assessment at various fixed timepoints: end of the working shift (nine studies), beginning of the shift [5, 32], mid-shift [7] and 2,5 h after start of shift [4, 45]. In 16 studies (26%), the staff were instructed to complete the BVC in relation to a specified event, for example, "post-operatively" [35], "before and after prayer" [10], "at admission" [53], "within 30 min of admission" [49] and "2 hours after admission" [31]. Thirty-four (55%) studies did not report the time at which the assessment was made. *Frequency of assessment*: In 21 (40%) studies, assessments were done three times a day; in six (10%) studies, assessments were conducted twice a day; and in three (5%) studies, the scoring was done only once per day. In 18 studies (29%), the instruction was to score at multiple timepoints, for instance, "on admission day and the following three days" [2], "at admission, on day 3 and at discharge" [11], and "once on the day of admission in the PICU" [21]. Fourteen (23%) studies did not report any information on this aspect. *Scoring format*: In 39 (63%) studies, the risk behaviour

items were rated dichotomously (0, 1) as in the original BVC version. In four (7%) studies, this was supplemented by using a VAS, as mentioned above. In the remaining studies (19, 30%), the recording procedure was not reported. In two studies, it was reported that the recording of the BVC was done electronically [11, 30]. *Profession*: In nearly three-quarters of the studies (46, 75%), nurses conducted the assessments, and in the remainder (12, 19%), a variety of mental healthcare professionals were involved.

Clinical utility: Eleven studies (18%) endorsed the high clinical utility and acceptability of the BVC. Comments from individual studies included approval of the tool for its user-friendliness [34], brevity "takes 2 minutes to complete" [40] and efficiency following the reduction in time required for extensive multidisciplinary discussions about patients [11]. It was also stated that the BVC is an inexpensive tool that can be integrated into daily practice [3]. Staff in the study with the supplementary VAS preferred this version as an addition to the original six-item version [2]. *BVC training*: Training provision was reported in 26 (42%) studies. Some of these studies reported that they had provided staff training but only a few gave information on the training format. Those that reported staff training described sessions duration ranging from 15 min to 1 h, delivered in small groups or individually using video or real-life simulation, such as role playing. Training was only described as mandatory in two studies [14, 28]. *Consequences of scoring (medium or high risk) in the BVC*: Fewer than half (n = 27) of the 62 studies described the type of intervention or preventive measures that were used after a high- or medium-risk score on a BVC assessment. All but one [2] of the studies used the original six-item version with the original cut-off. These interventions or measures can be grouped into four categories, which was guided by the stakeholders and via a discussion among the authors: (1) restrictive practices, such as seclusion, setting limits and mechanical restraints; (2) interactions, such as talking

to the patient, motivating the patient to engage in physical activities and verbal de-escalation; (3) multidisciplinary decision-making and/or advice, such as alerting a psychiatrist or other specialists; and (4) treatment decisions, such as offering PRN medication or considering referral to another ward (e.g. PICU).

3.1.3 | Meta-analysis (*n* = 15 studies)

Meta-analysis of the 15 studies in the subset revealed that heterogeneity existed ($Q = 321.3856$, df = 14, $p < .0001$ and $I^2 = 95.64\%$, 95% CI = 94.09 to 96.79); therefore, the random effects model was the appropriate choice. The AUC range across individual studies was 0.69–0.98, and the pooled AUC for the BVC was 0.826 (SE = 0.022, 95% CI = 0.783 to 0.868, $z = 38.716$, $p < .001$; see Figure 2).

The 15 studies were categorized according to geographical location (Europe or elsewhere) and rater profession (nurse only or otherwise).

The nine studies conducted in Europe were compared to six studies conducted elsewhere. Heterogeneity existed for studies within Europe ($Q = 77.8255$, df = 8, $p < .0001$ and $I^2 = 89.72\%$, 95% CI = 82.74 to 93.88) and the rest of the world ($Q = 57.4179$, df = 5, $p < .0001$ and $I^2 = 91.29\%$, 95% CI = 83.81 to 95.32). For studies within Europe ($N = 9$), the AUC range across individual studies was 0.69–0.88, and the random effects pooled AUC for the BVC was 0.798 (SE = 0.023, 95% CI = 0.753 to 0.843, $z = 34.627$, $p < .001$; see Supplementary File Figure S3a). For studies undertaken in the rest of the world ($N = 6$), the AUC range was 0.73–0.98, and the random effects pooled AUC for the BVC was 0.862 (SE = 0.035, 95% CI = 0.793 to 0.931, $z = 24.455$, $p < .001$; see Supplementary File B, Figure S3b).

Most studies ($n = 12$) reported assessments made only by nurses, but a small number ($n = 3$) involved assessments by other professionals or multiple professionals, including nurses. Heterogeneity existed for nurse-rater-only studies ($Q = 175.1003$, df = 11, $p < .0001$ and $I^2 = 93.72\%$, 95% CI = 90.78 to 95.72) and studies where either other professionals or multi-professionals performed the ratings ($Q = 131.0374$, df = 2, $p < .0001$ and $I^2 = 98.47\%$, 95% CI = 97.31 to 99.13). Studies where only nurses undertook the ratings ($N = 12$), the AUC range across studies was 0.75–0.93 and the random effects pooled AUC for the BVC was 0.833 (SE = 0.018, 95% CI = 0.797 to 0.868, $z = 45.510$, $p < .001$; see Supplementary File B, Figure S4a). For studies where either other professionals or multi-professionals conducted the ratings ($N = 3$), the AUC range was 0.69–0.98, and the random effects pooled AUC for the BVC was 0.802 (SE = 0.076, 95% CI = 0.654 to 0.950, $z = 10.607$, $p < .001$; see Supplementary File B, Figure S4b).

4 | DISCUSSION

To the best of our knowledge, this is the largest and most comprehensive international review of the BVC conducted in what is nearly 30 years since the inception of the instrument in 1995. It demonstrates that the tool has many impressive strengths, considering the brief time investment required for completion. It thus combines both scientific robustness and practical utility, and these strengths probably underpin its widespread adoption worldwide.

In this scoping review, we included 62 studies addressing the implementation of the BVC across various settings and countries. As described earlier, the studies included in the review were published between 2000 and 2021 and over half (51.6%) were published from 2015 onwards. It is difficult to understand if this increased output is because the awareness regarding violence against healthcare workers has improved or because the BVC is being used in more settings and countries. We believe that it certainly reflects the
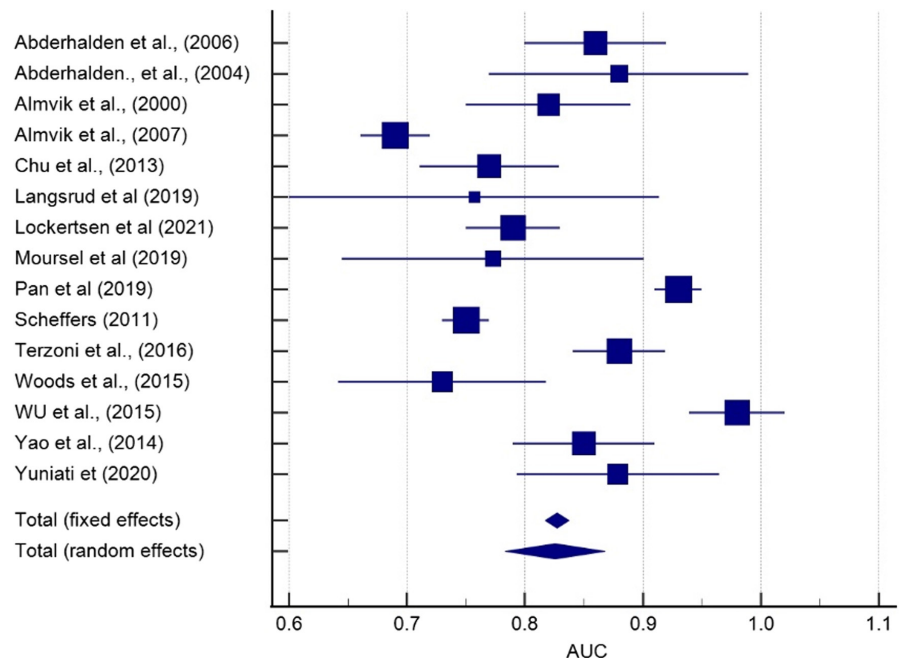

FIGURE 2 Brøset violence checklist meta-analysis (*N* = 15).

first statement about the increased awareness of violence against healthcare workers. Similarly, a systematic review by Liu et al. (2019) found a significant increase in the number of studies published on any type of workplace violence against healthcare workers during the period 2010–2018 (*n* = 61) versus 2000–2009 (*n* = 13).

We found that studies published on the BVC have been from 23 different countries worldwide. The studies included in this scoping review used research designs ranging from descriptive surveys, often as part of a quality improvement project, to prospective and retrospective cohort designs, validation studies, pre- and post-intervention studies and a few randomized controlled trials (RCT) with BVC as part of the intervention. This heterogeneity in study aims and designs reflects our broad scoping review methodology and shows that the BVC can be used in multiple ways to contribute to improved mental health care. Our findings show that more than half the studies were conducted in European countries rather than the rest of the world. A possible explanation for this trend could be that the BVC was developed in Norway and 20% of the included studies originated from this country alone.

We found that 49 (79%) studies reported their setting and over half of these studies were conducted in acute mental healthcare services, such as PICUs, EDs and adult acute and closed wards. Typically, these wards provide care for adult patients at the beginning of their treatment, during the period of adjusting to treatment or being in an aroused state. The remaining 17 (27%) studies were conducted across various wards and places. For instance, we found that studies conducted in child, adolescent and elderly services had investigated the predictive validity of the BVC. One unique setting was a church where the caregivers wanted to evaluate if the participant experienced manic symptoms after a religious service (Buckley, 2015). However, we often found it difficult to compare the types of wards because countries and services tend to use different names to describe services (e.g. specialties and security levels).

The BVC has been translated into 16 different languages. Such translations are a complex task in psychiatry even when dealing with single words or short items, as in the BVC. For instance, "boisterousness" is a subjective phenomenon even when rated by two practitioners in the same country. Translating such a term across languages, and especially across cultures, in a meaningful way is quite challenging.

Most of the studies included in the review used the original six-item version of the BVC, but a few had local alterations to the checklist, adding either one or two extra items. The motivation for adding items to the original version was, among other things, to focus on performing a specific assessment for making decisions on initiating specific interventions, for instance, segregating patients (Loi & Marlowe, 2017) or allowing for a possible refinement of the scale (Abderhalden et al., 2004). Adapting evidence-based tools for local needs raises questions about comparability across studies and the applicability of previous research to the revised tool. However, the altered version may be a better fit in some countries and settings and more effective as a decision-making tool for initiating specific interventions, such as seclusion. We encourage the

application of some form of precautionary principle prior to using the revised BVC to determine the choice of intervention that must be initiated if it is being used as a decision-making tool. Prior to such implementation, the altered checklist's ability to guide such an assessment must be examined. It is also possible to imagine a situation where an organization encourages staff members to use the BVC as an automated algorithm such that if a patient scores above a specified cut-off, then the staff are compelled to unmindfully implement a specific intervention. We advocate strongly against such a "one-size-fits-all" method and instead urge an individual approach to patient care.

There is always a need to be aware of, among other things, both false positives and false negatives (Singh, 2013) when using screening tools, such as the BVC. False positives can be described as the situation where the BVC assessment scores the patient as a "high risk" (e.g. score ≥2) of committing a violent act, which they do not then commit even when able to. False negatives are the reverse: the staff rate the patient as "low risk" (e.g. score = 0), but they then act violently. In a false-positive situation, the staff may implement an intervention that is intended to prevent the violent act, based on the apparent evidence provided by the assessment. As we found in the included articles that described interventions, restrictive interventions intended to prevent violence can be the trigger that actually initiates conflict between the staff and patient, so the opposite is achieved. It could be the flashpoint or containment practice that can paradoxically start a conflict (Bowers et al., 2014). In the opposite false-negative situation, where the patient has been inaccurately assessed as "low risk," the staff may interpret this as a situation requiring no input and the resources may, therefore, be diverted from this low-risk patient to other patients. If an incident occurs, notwithstanding the low-risk assessment, resources must be quickly reallocated. However, if this takes time, the situation may reach a stage where it turns violent or becomes more serious than if the staff had acted earlier regardless of the rating.

This raises the question regarding whether the BVC is best considered a diagnostic tool (such as an X-ray to be tested using the AUC methodology) or as an intervention (such as a drug to be tested using the RCT methodology). The heavy emphasis on predictive validity identified here using the AUC methodology assumes that the BVC is a tool solely for identifying the risk of violence which does not influence the subsequent implementation of interventions by staff. As high-risk BVC assessments indicate a potential for imminent violence, it is logical that the staff will intervene immediately to prevent violence, and, as a result, its likelihood is reduced. Thus, the association between high risk and actual violence is broken by the preventive actions of staff, and any outcome study assessing the association will find poor predictability. Tools, such as the BVC, can also be considered as interventions similar to structured professional judgement instruments, such as the Short-Term Assessment of Risk and Treatability (START), which are the starting point for an intervention. It is a positive outcome that some studies have recognized this and tested the BVC, as part of an intervention package, using the RCT methodology (e.g. Abderhalden et al., 2008).

Most of the included studies did not report the point at which the BVC assessment was conducted during a day. Those studies which did include information on time of assessment described a variety of different instructions ranging from the beginning of a shift to the end of a shift. Notably, this timing is based entirely top-down, based on staff working in shift patterns rather than being responsive to individual patient needs. In some studies, the instruction was more event-specific, for instance, at admission, post-operatively, or before and after a prayer. Good practice guidance can help instruct staff when best to assess a patient during a shift. In the majority of studies that described how often a BVC assessment should be conducted, staff were instructed to perform the assessment between once or three times a day, which may be due to the length of shifts in some settings or services. In other studies, staff were instructed to conduct the assessment once at admission or during the first 3 days of admission. As noted above, the outcome of a short-term risk assessment, such as the BVC, will influence staff decision-making about patient care in several ways, and if used with a short span of time between each assessment, it must be assumed that the likelihood of initiating interventions based on false positive scores is minimized.

Two key questions from the invited clinical experts in our consultation exercise were the need to know more about how feasible it is to implement the BVC in daily practice and how training in using the tool was provided. We did not identify any studies describing a formal implementation plan but developing such a plan would be a desirable objective for future evaluations. Instead, we found a few studies that included statements from staff about their experience of using the BVC. The consensus which emerges from these studies is that, as a tool, the BVC can be easily integrated into daily practice, as it is inexpensive, user-friendly and time efficient. In the few studies that provided information on training staff in using the BVC, the training was provided in many different ways, with the duration of delivery ranging from 15 min to 1 h. A range of formats was deployed for training groups or individuals remotely using either e-learning or face-to-face formats with or without video and/or role-play. Evidently, training in using the BVC need not take many hours, and we recommend that the training must be repeated over time. This is desirable partly due to staff turnover and the possibility that wards sometimes tend to formulate their own separate "in-house" culture influencing how they use the BVC.

Alongside its practical utility, evidence here from the meta-analysis shows that the BVC has strong predictive validity when treated as a diagnostic tool. The combined AUC from all the included studies was 0.83, and it ranged from 0.69 to 0.98 across these studies. This combined AUC value is excellent (Mandrekar, 2010) and is consistent with a previous review where the BVC performed the best out of 31 identified risk assessment tools (Whittington et al., 2013). It also confirms the endorsement of the BVC in recent national guidelines (Hauge et al., 2021; National Collaborating Centre for Mental Health (UK), 2015). Thus, a high score on the BVC can be assumed to be associated with a high risk of violence in the subsequent hours. However, this association is disconcerting because, as noted above, a high BVC score should lead to staff adopting preventive measures to reduce the likelihood of violence (Maguire et al., 2018). A high AUC value in this research and in previous studies indicates that either no action is taken because of the assessment or that unsuccessful interventions are implemented. In either case, further examination following a BVC assessment is required.

The high levels of heterogeneity across the aggregated studies in the meta-analysis indicate caution is required when considering this positive finding. The inclusion criteria for this part of the review ensured that only identical versions of the BVC were considered and the outcome was restricted to violent consequences following the exclusion of non-violent events such as seclusion. Focusing on one specific six-item single-word tool as a predictor is seemingly consistent compared to other reviews with multiple tools or complex non-behavioural phenomena, such as "motivation," in the START (Webster et al., 2009). As with the predictor items such as "boisterousness," definitions of the outcome and violence are notoriously variable across research studies in this area, often conflating verbal aggression, threats, abuse and property damage with interpersonal physical assaults (Schinkel, 2010). Finally, the duration of follow-up also varied across studies from 6 to 24 h. In acute settings, especially those with two timeframes, however close, may capture disparate degrees of fluctuation in a person's mental state.

Two subgroup analyses were conducted, although it must be recalled that some subgroups had only a small number of studies. Notably, the pooled AUC was substantially lower in studies conducted in European settings (0.80) compared to that for those conducted outside of Europe (0.86). Since the BVC was initially developed in Europe, this finding is puzzling. A close inspection of Figure S3b (Supplementary File) indicates that two recent studies (Pan et al., 2019; Yu-Fei et al., 2015) with a relatively large Chinese sample reported higher AUCs, and they may have unduly influenced the pooled estimate. Alternatively, it seems that the non-European studies are more recent, and this may reflect improvements in implementing the BVC over the past few years. In comparison, there was no substantial difference according to rater characteristics, suggesting that the tool is equally effective regardless of which profession conducts the ratings. The latter finding may reflect the importance of specific BVC training in overriding professional orientations.

4.1 | Strengths and limitations

This review provides both a broad scope of evidence on practical issues when implementing the BVC and a specific new estimate of its predictive validity. The aims of our review were explicitly grounded in the questions raised by staff on the front line of mental health care, consistent with the scoping review principles. The use of this consultation exercise provided the opportunity to include questions in our extraction strategy that we, as experienced researchers, may not have considered. A systematic and comprehensive approach has been adopted to find and synthesize the relevant material. The search strategy was very broad and conducted in consultation with an experienced research librarian, and two reviewers independently

scrutinized all the studies at the inclusion and extraction phases. However, some limitations must be acknowledged. First, the literature that was not in English or Scandinavian languages was not formally translated. There were particular challenges when articles were only available full text in Cyrillic or Mandarin characters. In terms of data extraction, textual variables, such as "ethical issues," sometimes required highly complex and subjective evaluations, and it was difficult to cross-check them for inter-coder reliability. There has been no attempt here to assess the quality of the studies in the meta-analysis when this may have varied across studies in a way that systematically influenced the reported AUCs. Finally, it is important to note that two of the authors were originators of the BVC, and they have been involved in its development and implementation over a long period.

5 | CONCLUSIONS AND IMPLICATIONS FOR RESEARCH AND PRACTICE

From this combined scoping review and meta-analysis, it is clear that the BVC has been widely translated and implemented at least once in most regions worldwide and in a wide variety of mental healthcare settings. It is highly valued as a brief but effective tool in practice. However, this apparently consistent implementation masks a great diversity of approaches in specific settings. We found that in an attempt to improve the tool's capacity or adapt it to local conditions, the BVC had been modified in some cases by either adding or removing variables. Furthermore, wards that used the BVC had unique approaches on how it was scored, how often it was used, at what time on duty the scoring was done, and how staff were trained if they actually were. Although these variations in practice seem inevitable, they ultimately restrict any attempt to summarize the state-of-the-art practice in this area. With the help of the meta-analysis, we found the combined AUC from all the included studies was 0.83 and ranged from 0.69 to 0.98 across these studies. This combined AUC value is at an excellent level.

This in-depth study on the use and development of the BVC has revealed some areas that have not been investigated so far, for instance, the patient perspective on the use of a risk assessment that, as previously mentioned, has the potential to stigmatize them as an individual and even trigger inappropriate interventions in an attempt to prevent future violence. It is highly desirable to examine if the BVC can be used collaboratively as a self-rating tool that patients can use to assess themselves and thereby perhaps use as a self-defined intervention in a prevention plan. We advocate future research that explores the development of a patient protocol for completing the BVC and studies that focus on patients' perceptions on the use of the BVC in their daily care.

AUTHOR CONTRIBUTION

Jacob Hvidhjelm is responsible for conception and design, acquisition of data, quality appraisal, analysis and interpretation of data, drafted the manuscript, has given the final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Lene Lauge Berring has made substantial contributions to conception and design, acquisition of data, quality appraisal, analysis and interpretation of data and has been involved in drafting the method section and qualitative data and revising the manuscript critically for important intellectual content, has given final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Richard Whittington has made substantial contributions to conception and design, acquisition of data, quality appraisal, analysis and interpretation of data and has been involved in drafting the method section and meta-analysis section and has been involved in revising the manuscript critically for important intellectual content, has given final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Phil Woods has made substantial contributions to conception and design, acquisition of data, quality appraisal, analysis and interpretation of data and has been involved in drafting the method section and Meta-analysis section and has been involved in revising the manuscript critically for important intellectual content, has given final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Jesper Bak has made substantial contributions to the acquisition of data and quality appraisal, has been involved in revising the manuscript critically for important intellectual content, has given final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Roger Almvik has made substantial contributions to conception and design, acquisition of data, quality appraisal, analysis, and interpretation of data and has been involved in revising the manuscript critically for important intellectual content, has given final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST STATEMENT
No conflict of interest to declare.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available on request from the first author.

ETHICAL APPROVAL

No ethics committee approval was required as this was a review of existing literature. The authors followed the Vancouver guidelines.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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