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Article

# The BPPV-SQ: Development and Clinical Evaluation of a Brief Screening Questionnaire for Benign Paroxysmal Positional Vertigo

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## Abstract

**Background:** Benign paroxysmal positional vertigo (BPPV) is the most common cause of peripheral vertigo and is diagnosed clinically, yet many patients initially present in primary care. Early identification may optimize referral and management. **Objective:** To perform a pilot Phase 1 validation of the BPPV-SQ, a brief screening questionnaire designed for future use in general practice, assessing its ability to identify BPPV, suggest canal involvement, and support progression to Phase 2 validation. **Methods:** In this prospective observational study, 108 patients with positional vertigo and no neurological signs were evaluated in a specialist setting. The 7-item dichotomous questionnaire (score 0–3 for diagnostic core) was administered prior to bedside examination, which served as the reference standard. **Results:** Confirmed BPPV increased with higher scores. Among patients with score 3, BPPV was confirmed in 73.5%, with 69.4% lateralization concordance. Lower scores (0–1) were associated with low confirmation rates (14.3%). **Conclusions:** In this pilot Phase 1 validation, the BPPV-SQ demonstrated score-dependent diagnostic reliability and acceptable lateralization agreement in high-score patients, supporting progression to Phase 2 validation in primary care.

**Keywords:** questionnaire; BPPV; screening

## 1. Introduction

Benign paroxysmal positional vertigo (BPPV) is the most frequent cause of peripheral vestibular vertigo and is typically attributed to canalolithiasis or cupulolithiasis, conditions in which displaced otoconia from the utricle migrate into a semicircular canal or adhere to the cupula [1]. The resulting abnormal endolymphatic dynamics generate brief episodes of positional vertigo associated with characteristic nystagmus patterns [2]. Diagnosis is primarily clinical and relies on a detailed history combined with the identification of positional nystagmus elicited by specific maneuvers. Accurate localization of the affected ear and semicircular canal is essential for appropriate therapeutic repositioning [1]. In routine clinical practice, a substantial proportion of patients with dizziness initially consult general practitioners (GPs) [3]. In this setting, the ability to preliminarily identify subjects with suspected BPPV—particularly those without neurological signs or relevant neurological history—is of considerable importance. Early recognition may facilitate appropriate referral, reduce unnecessary diagnostic investigations, and shorten the time to effective treatment. The present study represents a pilot Phase 1 validation study. Its primary objective was to test the diagnostic performance of a brief and easily administrable screening questionnaire (BPPV-SQ), conceived for future use in primary care settings. Specifically, the study aimed:

1. To evaluate whether the BPPV-SQ can reliably identify patients with clinical features consistent with BPPV.

2. To assess its ability to suggest canal involvement and side lateralization.

3. To determine whether the questionnaire demonstrates sufficient diagnostic performance to justify progression to a Phase 2 validation study in general practice.

To reduce diagnostic bias and increase clinical accuracy, the instrument was intended to be applicable primarily to patients with recent-onset positional vertigo (ideally  $\leq 15$  days) and without current or previous neurological symptoms.

## 2. Materials and Methods

### Study Design and Rationale (Pilot Phase 1 Validation Study)

This prospective observational study represents the pilot Phase 1 validation study of the BPPV-SQ. Importantly, the questionnaire was not initially tested in primary care physicians. Instead, it was validated in a controlled specialist setting in order to assess its reliability before implementation in general practice. The study was conducted at the Otoneurology Units of Matera and Policoro (Basilicata, Italy). The study population consisted of patients reporting vertigo referred from the Emergency Department without current or previous neurological symptoms or signs suggestive of central pathology. The rationale for this pilot Phase 1 validation study was:

- To test the questionnaire in a controlled clinical environment;
- To evaluate its diagnostic agreement with specialist bedside assessment (reference standard);
- To estimate whether a sufficiently high proportion of positive correspondence (preliminarily considered  $\geq 60$ –70% in high-score categories) could justify progression to a Phase 2 validation study in general practice.

## 3. Study Population

A total of 108 consecutive patients presenting with vestibular complaints were enrolled (56 women, 52 men; mean age 50.2 years, range 29–87 years). Although recent onset ( $\leq 15$  days) was considered ideal for future application, this pilot Phase 1 validation study included consecutive eligible patients meeting the inclusion criteria.

## 4. Questionnaire Structure

The BPPV-SQ consists of seven dichotomous (Yes/No) items (Table 1).

Items 1–3 (Diagnostic Core – D):

1. Vertigo triggered by head movements.
2. Rotatory sensation.
3. Brief duration ( $\leq 3$  minutes).

These items generate a cumulative diagnostic score (0–3):

- 0 = No BPPV
- 1 = Possible BPPV
- 2 = Probable BPPV
- 3 = Definite BPPV

Items 4–5 (Canal Suggestion – C):

- Item 4: Posterior canal–suggestive movements.
- Item 5: Lateral canal–suggestive movements.

Items 6–7 (Lateralization – L):

- Symptom predominance on one side.
- Preferred sleeping side.

All responses were coded as binary variables (Yes = 1; No = 0).

The questionnaire was administered prior to clinical examination or instrumental assessment and could be self-administered or completed with minimal assistance.

Table 1.

**QUESTIONARIO DI SCREENING PER PAZIENTI CON SOSPETTA VPPB****BPPV- SQ**

1D.

Italiano: La vertigine è scatenata dai movimenti della testa, come quando ci si sdraia a letto, quando ci si alza dal letto, piegandosi in avanti con la testa, sollevando la testa verso l'alto o girandosi nel letto su un lato?

English: Is your vertigo triggered by head movements, such as when lying down in bed, getting out of bed, bending forward, looking upward, or turning over in bed onto one side?

a. Sì / Yes

b. No / No

2D.

Italiano: Quando hai le vertigini, senti come se tutto ti girasse intorno?

English: When you experience vertigo, does it feel as though everything is spinning around you?

a. Sì / Yes

b. No / No

3D.

Italiano: La vertigine è breve e dura al massimo tre minuti?

English: Is the vertigo brief, lasting no more than three minutes?

a. Sì / Yes

b. No / No

4C.

Italiano: La vertigine è scatenata dal movimento della testa quando ci si piega in avanti, si solleva la testa verso l'alto, ci si alza dal letto o ci si sdraia a letto?

English: Is the vertigo triggered by head movement when bending forward, looking upward, getting out of bed, or lying down in bed?

a. Sì / Yes

b. No / No

5C.

Italiano: La vertigine è scatenata dal movimento della testa girandosi su un lato nel letto o girando la testa da un lato?

English: Is the vertigo triggered by turning over onto one side in bed or by turning your head to one side?

a. Sì / Yes

b. No / No

6L.

Italiano: La vertigine è peggiore quando ci si gira su un lato specifico?

English: Is the vertigo worse when turning onto one particular side?

a. Sì – lato destro / lato sinistro

Yes – right side / left side

b. No / No

7L.

Italiano: Preferisci dormire su un lato?

English: Do you prefer to sleep on one side?

a. Sì – lato destro / lato sinistro

Yes – right side / left side

b. No / No

Punteggio / Scoring

Sì = 1 No = 0

Yes = 1 No = 0

- Questions 1–2–3 → D (Diagnosi di VPPB / Diagnosis of BPPV)
- Question 4 → Canale posteriore / Posterior canal

- 
- Question 5 → C (Canale laterale / Lateral canal)
  - Questions 6–7 → L (Lato / Side involved)

Total Score (Diagnostic Questions D 1–2–3)

0 = Non VPPB / No BPPV

1 = VPPB possibile / Possible BPPV

2 = VPPB probabile / Probable BPPV

3 = VPPB certa / Definite BPPV

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#### 4.1. Reference Standard

Definitive diagnosis of BPPV was established or excluded through bedside vestibular examination using Frenzel goggles and appropriate positional maneuvers.

#### 4.2. Statistical Analysis

Descriptive statistics were calculated as absolute numbers and percentages.

Diagnostic performance was evaluated by comparing questionnaire results (particularly score = 3 and score  $\geq 2$ ) with the final clinical diagnosis. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were estimated for selected score thresholds (score = 3 vs.  $<3$ ; score  $\geq 2$  vs.  $<2$ ). Agreement between questionnaire-based lateralization and specialist clinical findings was assessed descriptively as percentage concordance.

#### 4.3. Ethical Considerations

All patients provided written informed consent for the collection and use of their clinical data for research purposes. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

### 3. Results

Among the 108 patients:

Score 0: 14 patients (12.96%)

BPPV confirmed in 2 cases (14.29%)

Score 1: 14 patients (12.96%)

BPPV confirmed in 2 cases (14.29%)

Score 2: 34 patients (31.48%)

BPPV confirmed in 8 cases (23.53%)

Lateralization concordance: 3/8 cases (37.50%)

Score 3: 49 patients (45.37%)

BPPV confirmed in 36 cases (73.47%)

Lateralization concordance: 25/36 cases (69.44%)

Overall, higher questionnaire scores were associated with an increased probability of confirmed BPPV. When considering a threshold of score = 3 as positive, the questionnaire demonstrated a positive predictive value of approximately 73%, with a progressive increase in diagnostic probability across score categories. Lower scores (0–1) were associated with a low probability of confirmed BPPV, suggesting potential utility in excluding clinically evident cases in selected contexts.

### 4. Discussion

Patients with dizziness frequently present first to primary care services. In this context, the GPs plays a pivotal role in distinguishing peripheral vestibular disorders from alternative etiologies, including central causes that may require urgent investigation [4]. Several validated questionnaires have been proposed to aid in the evaluation of dizzy patients [5–8]. Recently, Yan et Al. Developed a questionnaire for self-diagnosis of BPPV, which can be used for self-application of appropriate CRP by determining the affected ear and subtype of BPPV when it occurs and recurs [9]. To the best of our

knowledge, the literature has not yet reported a simple and user-friendly questionnaire specifically designed for use in GP settings, aimed at patients presenting with symptoms suggestive of positional vertigo. This pilot Phase 1 validation study represents the first structured validation step of the BPPV-SQ in a specialist-controlled setting prior to its implementation in primary care. The objective of this pilot Phase 1 validation study was not to provide definitive estimates of diagnostic accuracy, but to assess feasibility, internal coherence, and agreement with specialist diagnosis as a reference standard.

The findings indicate:

- A clear correlation between increasing questionnaire score and confirmed BPPV;
- Good diagnostic reliability in patients with the maximum score (3);
- Moderate-to-good lateralization concordance in high-score patients (approximately 69%).

These results suggest that the BPPV-SQ may have practical value as a triage tool, particularly when high scores are obtained, and support progression to a \*\*Phase 2 validation study in general practice.

However, the study has several limitations:

- Relatively small sample size;
- Single-region specialist setting;
- Absence of immediate validation in primary care;
- Inclusion of patients not strictly limited to very recent onset in all cases.

Further studies are required to evaluate sensitivity, specificity, and predictive values in broader and less selected populations.

## 5. Conclusions

The BPPV-SQ is a brief and easily administrable screening questionnaire designed for potential use in primary care settings.

In this pilot Phase 1 validation study, the instrument demonstrated:

- Good diagnostic reliability in patients with the highest scores;
- A clear score-dependent increase in the probability of confirmed BPPV;
- Acceptable lateralization agreement in definite cases.

These findings support progression to a Phase 2 validation study in general practice, in which the questionnaire will be directly administered by general practitioners to patients presenting with recent-onset positional vertigo, in order to evaluate its real-world performance, feasibility, and impact on referral pathways. Larger, multicenter studies will subsequently be required to better define its sensitivity, specificity, and predictive values in real-world primary care settings.

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