



# The Most Effective and Efficient Bedside Exam for the Dizzy Patient in the Acute Care Setting: A Systematic Review of the Literature

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## Introduction

Dizziness is one of the most common symptoms and chief complaints of patients presenting in the emergency department, with nearly 7.5 million patients examined annually for this condition.<sup>1</sup> Dizziness can present as a symptom of an emergency situation suggesting a central disorder or a symptom of a nonthreatening peripheral disorder.<sup>1,2</sup> Bedside testing can be used during a thorough examination of a patient by a physical therapist to differentially diagnose a patient with complaints of dizziness.<sup>3,4</sup> The term bedside testing, as used by the investigators, refers to objective tests that can be performed without equipment in the acute care setting. A list of bedside vestibular tests and differential diagnosis of central versus peripheral disorders can be found in Table 1.

If a central disorder is suspected, the patient may need to be referred to the appropriate health care provider and may require additional testing.<sup>2,3,5</sup> If a peripheral disorder is suspected, appropriate bedside tests will be used to determine a physical therapy (PT) plan of care.<sup>2,3,5,6</sup>

According to the American Physical Therapy Association, PT graduates should be able to select and perform tests and measures accurately related to vestibular testing, identify the natural course of a pathology, including vestibular disorders, and interpret examination items of these patients.<sup>7</sup> Hence, vestibular testing should be included in the scope of practice for acute care physical therapists. Additionally, acute care physical therapists are required to be efficient and effective in their examination techniques, therefore requiring bedside testing to be identified that meets this criteria.

Table 1. Vestibular Test Results for Central & Peripheral Pathologies

Vestibular Test	Central	Peripheral
Head Impulse Test (HIT) <sup>8-11</sup>	Negative	Positive
Skewed Deviation (SD) <sup>9,10</sup>	Positive	Negative
Vertical Smooth Pursuit <sup>9,10</sup>	Positive	Negative
Head Shaking Nystagmus (HSN) <sup>8</sup>	Negative	Positive
Dix-Hallpike Maneuver <sup>3,12</sup>	Negative	Positive
Spontaneous Nystagmus (SN) <sup>8,11</sup>	Negative	Positive
Vertical Nystagmus <sup>9,10</sup>	Positive	Negative

## Purpose

The purpose of this systematic review of the literature (SRL) is to evaluate the effectiveness and efficiency of vestibular bedside tests for patients with complaints of dizziness and vertigo in the acute care setting. This includes differentiating between a central and peripheral disorder, as well as diagnosing peripheral disorders within the scope of physical therapy practice.

## Methods

An original search was conducted on July 16, 2015 using four databases (PubMed, CINAHL, Cochrane, and Scopus) with the following search terms: acute dizziness OR acute vertigo AND physical examination NOT ultrasound. A repeat search of the literature was conducted on January 21, 2016 with the same search strategy, terms, inclusion and exclusion criteria. Figure 1 illustrates the selection of studies for this SRL.

- Inclusion Criteria:** mention of bedside dizziness, bedside exam used, published within last 10 years
- Exclusion Criteria:** not in English, published before 10 years, peripheral vestibular diagnosis not mentioned, not an original research article with participants, exam technique not performed bedside

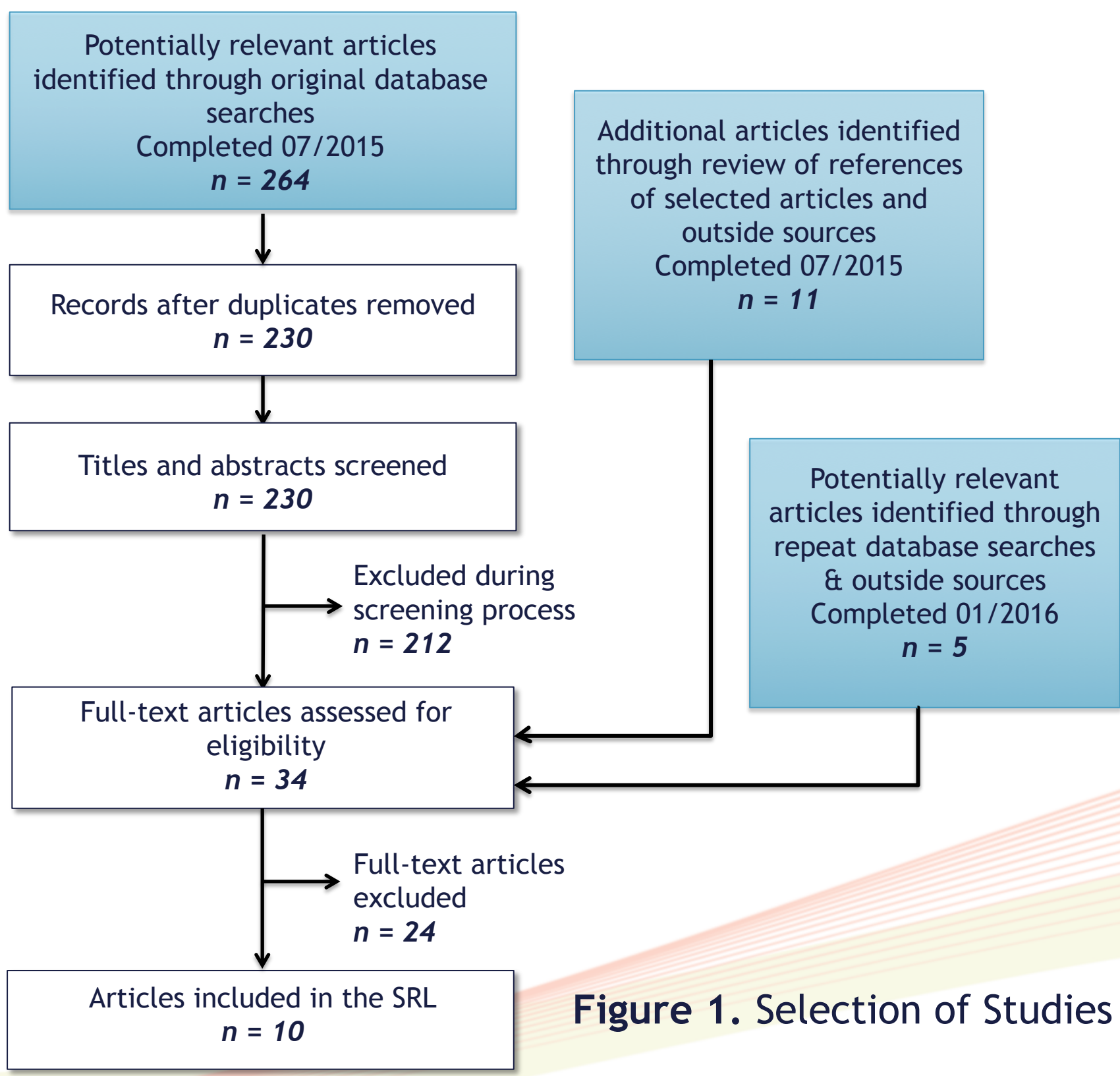


Figure 1. Selection of Studies

## Results

Table 2. Sensitivity & Specificity of Vestibular Tests

Vestibular Test	Study	Sensitivity (95% CI)	Specificity (95% CI)
Head Impulse Test	Pavlin <sup>11</sup> , 2015	80% (54.8-93.0%)	92.3% (66.7-98.6%)
	Chen <sup>9</sup> , 2011	80%	90%
	Cynrim <sup>10</sup> , 2008	60%	93%
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 25%)	47%	96%
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 50%)	64%	92%
Vertical Saccadic Pursuit	Chen <sup>9</sup> , 2011	70%	90%
	Cynrim <sup>10</sup> , 2008	88%	80%
Skew Deviation	Chen <sup>9</sup> , 2011	30%	90%
	Cynrim <sup>10</sup> , 2008	40%	100%
Head Shaking Nystagmus	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 25%)	55%	90%
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 50%)	73%	86%
Spontaneous Nystagmus	Pavlin <sup>11</sup> , 2015	100% (79.6-100%)	92.3% (66.7-98.6%)
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 25%)	33%	98%
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 50%)	42%	95%
Central Type Nystagmus	Chen <sup>9</sup> , 2011	56%	100%
	Cynrim <sup>10</sup> , 2008	56%	83%
Skew Deviation and Head Tilt	Chen <sup>9</sup> , 2011	80%	90%
Combined Vestibular Tests	Study	Sensitivity (95% CI)	Specificity (95% CI)
STANDING Protocol	Vanni <sup>13</sup> , 2014	100% (72.3-100%)	94.3% (90.7-94.3%)
	Vanni <sup>14</sup> , 2015	92.9% (70.0-100%)	96.4% (93.0-38.0%)
Triple Test	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 25%)	64%	85%
	Rohmeier <sup>8</sup> , 2013 (UW, ≥ 50%)	82%	81%

### Sensitivity & Specificity of Bedside Vestibular Tests

A majority of studies in this SRL reported high specificity and variable sensitivity<sup>8-11,13,14</sup> for bedside vestibular tests as shown in Table 2. Several studies used a combination of vestibular tests for differential diagnosis of a vestibular disorder.<sup>8,13,14</sup> The triple test is comprised of three bedside exams: SN, HIT, and HSN.<sup>8</sup> Another test combining multiple bedside tests is the STANDING protocol.<sup>13,14</sup> The STANDING protocol is a four step diagnostic test that addresses the sequence in which tests should be performed in order to obtain an accurate diagnosis. The diagnostic signs and bedside maneuvers assessed in STANDING include: direction of nystagmus, HSN, Dix-Hallpike, Pagni McClure test, HIT, saccades, smooth pursuit, skew deviation, and gait assessment.<sup>13,14</sup>

### Time Efficiency

Two of the ten included articles discussed time efficiency as an attribute of an examination item. The tests examined were the triple test and the STANDING protocol.<sup>8,14</sup> Rohrmeier et al. found that the three individual components of the triple test take less than 2 minutes to complete, which equates to 1/10 of the time it takes to complete caloric testing.<sup>8</sup> The STANDING protocol can be performed within 6-17 minutes, averaging 9.9 +/- 2.8 minutes depending on the examiner.<sup>14</sup>

### Benign Paroxysmal Positional Vertigo (BPPV)

Three of the ten articles discussed BPPV as a potential vestibular disorder which can be diagnosed using a bedside exam.<sup>3,4,12</sup> Stam et al. published a case study in which two patients were examined by physical therapists in the acute care setting.<sup>3</sup> Of the two patients, one demonstrated a positive finding on the Dix-Hallpike Maneuver and was therefore presumed to have BPPV.<sup>3</sup> In another case study, Bashir et al. describes a patient with a positive finding on the Dix-Hallpike Maneuver, which suggests the presence of BPPV.<sup>12</sup> The test was performed by a general practitioner in the patient's home.<sup>12</sup> A third article published by Horn et al., described the physical therapist's examination process which analyzed a patient in a hospital with BPPV.<sup>4</sup> Following a negative Dix-Hallpike Maneuver, the researchers performed the supine roll test to differentially diagnose the patient with lateral canal BPPV.<sup>4</sup>

## Discussion & Limitations

- A general trend of high specificity and variable sensitivity was found in most vestibular tests.<sup>8-11,13,14</sup> A peripheral vestibular test with high specificity suggests the patient is presenting with a peripheral disorder when the test result is positive. In contrast, a central vestibular test with high sensitivity differentiates to the examiner that when a negative result is found, a peripheral disorder is likely the cause.
- The Dix-Hallpike Maneuver is considered the gold standard when diagnosing BPPV<sup>3,4,8,12</sup>, however the psychometric properties were not priority in the research articles identified through this SRL search.<sup>3,4,12</sup> The Dix-Hallpike Maneuver can be performed bedside, and should be considered an essential component of vestibular testing.<sup>8</sup>
- The Triple Test and STANDING protocol are combined tests that demonstrated high specificity for diagnosing peripheral vestibular disorders.<sup>8,13,14</sup> Though the Triple Test was strategically designed, unless all three tests are positive, the gold standard caloric test is still required in order to confirm a peripheral diagnosis.<sup>8</sup>
- Time efficiency may improve the overall effectiveness of a clinician's exam.<sup>8,14</sup> There are a few gold standard tests used for differential diagnosis of central versus peripheral disorders when diagnosing a patient with dizziness.<sup>15,16</sup> However, these exams can be lengthy due to the use of additional equipment and the potential need to consult other professionals.<sup>15,16</sup> All of the bedside vestibular tests identified in this SRL can be performed by physical therapists without the need for supplementary equipment.<sup>3,4,8-14,17</sup>
- The number of studies that addressed combined vestibular tests in order to diagnose dizziness in the acute care setting is sparse. A successful combination of tests may result in a more efficient and time effective approach in differential diagnosis of a patient with dizziness.

### Limitations

- No randomized controlled trials available on this topic, low PEDro scores, few studies addressing combined vestibular exams, a narrow breadth of research, and limited investigator analysis

## Conclusion

This SRL found ten published articles addressing bedside examination items for diagnosing vestibular disorders.<sup>3,8-14,17</sup> The search produced case studies and cohort studies, limiting our ability to determine the most efficient and effective exam at this time. A majority of the included articles addressed the specificity and sensitivity of individual tests, however did not address the best combination of tests for a comprehensive vestibular exam.<sup>9,10,11</sup> Future research is needed to determine the most effective and efficient bedside examination and appropriate pairing of tests to diagnose dizziness in the acute care setting.

## References

- Kulstad, Christine, and Blaine Hannafin. "Dizzy and Confused: A Step-by-Step Evaluation of the Clinician's Favorite Chief Complaint." *Emergency Medicine Clinics of North America* 28.3 (2010): 453-69. Web.
- Wiperman, Jennifer. "Dizziness and Vertigo." *Primary Care: Clinics in Office Practice* 41.1 (2014): 115-31.
- Stam, Daniel, David Village, and Lee Olson. "Benign Paroxysmal Positional Vertigo in the Acute Hospital Setting: Review of a Novel Means for Examination and Intervention." *Journal of Acute Care Physical Therapy*, 2014. Web.
- Horn, Amy. "Physical Therapy Diagnostic Process in a Hospital Inpatient with Lateral Canal Benign Paroxysmal Positional Vertigo and Vestibular Hypofunction." *Journal of Acute Care Physical Therapy*. 7.1 (2016): 5-15.
- Campeau, Michele, Colin Grove, Britta Smith, and Nicole Van Heuklon. "Evaluating and Treating Patients with Vestibular Syndromes in Acute Settings." Combined Sections Meeting, Las Vegas, Feb. 2014. Lecture.
- Kerber, Kevin A. "Vertigo and Dizziness in the Emergency Department." *Emergency Medicine Clinics of North America* 27.1 (2009): 39-50. Web.
- Neurology Section. "Neurologic entry-level curricular content integrated with a normative model of physical therapist professional education. 2011.
- Rohrmeier, Christian, Otto Richter, Michael Schneider, Kornelia Wirsching, Isabella Fiedler, Frank Haubner, Jürgen Strutz, and Thomas S. Kühnel. "Triple Test as Predictive Screen for Unilateral Weakness on Caloric Testing in Routine Practice." *Otology & Neurology* 34.2 (2013): 297-303. Web.
- Chen, L., W. Lee, B. R. Chambers, and H. M. Dewey. "Diagnostic Accuracy of Acute Vestibular Syndrome at the Bedside in a Stroke Unit." *Journal of Neurology* 258.5 (2011): 855-61. Web.
- Cynrim, C. D., D. Newman-Toker, C. Karch, T. Brandt, and M. Strupp. "Bedside Differentiation of Vestibular Neuritis from Central 'vestibular Pseudoneuritis'" *Journal of Neurology, Neurosurgery & Psychiatry* 79.4 (2008): 458-60. Web.
- Pavlin-Premrl, Davor, John Waterston, Sean McGuigan, Bernard Infeld, Ron Sultana, Richard O'Sullivan, and Richard P. Gerraty. "Importance of Spontaneous Nystagmus Detection in the Differential Diagnosis of Acute Vertigo." *Journal of Clinical Neuroscience* 22.3 (2015): 504-07. Web.
- Bashir, Khalid, Tooba Tariq, Furqan B. Irfan, and Sameer A. Pathan. "Resolution of Severe Vertigo in a Remote Location by the Modified Epley Maneuver." *Journal of Emergency Medicine, Trauma and Acute Care* 2015.1 (2015): n. pag. Web.
- Vanni, S., P. Pecci, C. Casati, F. Moroni, M. Rizzo, M. Ottaviani, P. Nazerian, S. Grifoni, and P. Vannucchi. "STANDING, Four-step Bedside Algorithm for Differential Diagnosis of Acute Vertigo in the Emergency Department." *ACTA Otorhinolaryngologica Italica* 34 (2014): 419-26. Web.
- Vanni, Simone, Peiman Nazerian, Carlotta Casati, Federico Moroni, Michele Rizzo, Maddalena Ottaviani, Rudi Pecci, Giuseppe Pepe, Paolo Vannucchi, and Stefano Grifoni. "Can Emergency Physicians Accurately and Reliably Assess Acute Vertigo in the Emergency Department?" *Emergency Medicine Australasia* 27.2 (2015): 126-31. Web.
- "Bilateral Vestibular Loss." *BalanceMD*, N.p., 2015. Web. Sept. 2015.
- Clendaniel, Richard A. "Medical Assessment and Vestibular Function Tests." *Vestibular Rehabilitation*. By Susan J. Herdman. 4th ed. Philadelphia: Davis, 2014. 182. Print.
- Mandalá, Marco, Daniele Nuti, Aimee Teo Broman, and David Samuel Zee. "Effectiveness of Careful Bedside Examination in Assessment, Diagnosis, and Prognosis of Vestibular Neuritis." *Archives of Otolaryngology-Head & Neck Surgery* 134.2 (2008): 164-69. Web.