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Clinical Decision Tool Reviews

Updated Review of the Burch-Wartofsky Score

Hafsa Majeed, MBBS, MD[1]

[1] Endocrinology, Northside Hospital

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Abstract

The Burch-Wartofsky Point Scale (BWPS) is a clinical scoring tool introduced in 1993 to assess the likelihood of thyroid storm in patients with thyrotoxicosis. It assigns points for thermoregulatory dysfunction (fever), central nervous system effects, gastrointestinal-hepatic dysfunction, cardiovascular dysfunction (tachycardia, atrial fibrillation, heart failure), and the presence of a precipitating event. The total score ≥45 is highly suggestive of thyroid storm requiring ICU admission and aggressive multi-modal therapy; 25–44 indicates impending storm warranting close monitoring and treatment; and <25 makes thyroid storm unlikely, shifting focus to identifying and managing the underlying cause of thyrotoxicosis.

I. How to Use

When to Use

The Burch-Wartofsky Point Scale (BWPS) is used in patients with hyperthyroidism who exhibit signs of systemic decompensation (e.g., fever, tachycardia, psychosis, heart failure, altered mental status) to assess the likelihood of thyroid storm.[1] It assigns points for specific criteria, enabling clinicians to categorize the likelihood of thyroid storm (e.g., a score ≥45 suggests thyroid storm; 25–44 suggests impending storm). An important prerequisite for its use is confirmation of biochemical hyperthyroidism with suppressed TSH and elevated free T4 and total T3 levels (however, the severity of thyroid hormone abnormality does not necessarily correlate to the risk of thyroid storm). It aids in triaging patients who require intensive care versus those who can be managed in a less acute setting.

Pearls / Pitfalls

The BWPS evaluates the severity by assigning points to symptoms across multiple organ systems affected by hyperthyroidism, including cardiovascular (tachycardia, atrial fibrillation), thermoregulatory (fever), neurological (agitation, delirium), and gastrointestinal systems (nausea, vomiting, diarrhea), as well as precipitating events. This holistic approach ensures clinicians do not miss critical signs of thyroid storm. However, it's important to note that some of the criteria are subjective (e.g. severity of CNS symptoms and symptoms of heart failure) and rely on subjective clinical judgment, which can lead to variability and false positive and negative results. Given the high mortality/morbidity associated with thyroid storm, the BWPS intentionally utilizes liberal criteria and non-specific indicators (tachycardia, fever, nausea) which may also lead to false positives.

Rarely, thyroid storm can present atypically as apathetic storm, particularly in the elderly, characterized by extreme weakness, emotional apathy, confusion, and minimal or absent fever, differing from classic symptoms which may be missed by the BWPS.

The BWPS was developed based on data from Western populations, and its performance in diverse ethnic groups or in resource-limited settings is less studied.

The pediatric adaptation of the BWPS is a modified version of the original BWPS designed to assess the severity of thyrotoxicosis and diagnose thyroid storm in children.[2]

Why Use

The BWPS provides a structured, objective framework to evaluate the severity of thyrotoxicosis and is the most widely accepted system, endorsed by the American Thyroid Association.[3]

Thyroid storm carries a high mortality rate of approximately 10–25%, even with prompt treatment. Survivors may face irreversible complications, such as brain damage, disuse atrophy, cerebrovascular disease, renal insufficiency, and psychosis. The BWPS enables risk stratification, guiding clinicians in determining the appropriate level of care for patients with severe thyrotoxicosis.

II. NEXT STEPS

Advice

BWPS ≥45: Highly suggestive of thyroid storm; Recommend admission to ICU and aggressive medical therapy with Anti-thyroid drugs, corticosteroids, SSKI, bile acid sequestrants, beta blockers along with supportive care - cooling blankets, antipyretics (avoid aspirin), IV hydration and treat precipitating factors

BWPS 25-44: Impending thyroid storm; consider medical therapy with thionamides, beta blockers, bile acid sequestrants and/or SSKI. Consider close monitoring in ICU.

BWPS <25: Thyroid storm unlikely; investigate the etiology of thyrotoxicosis and consider antithyroid drugs and, if necessary, beta blockers based on etiology.

Management

Search for potential precipitant(s) of thyroid storm: infection, thyroidal/non-thyroidal surgery, medications (anesthetics, pseudoephedrine, amiodarone), iodinated contrast exposure, DKA, exogenous thyroid hormone, CVA, MI, PE. Evaluate the cause of hyperthyroidism – Graves' disease, Thyroiditis, toxic nodules or medication-induced.

Target treatment towards thyroid hormone formation, release, and adrenergic action:

1. Anti-thyroid drug therapy (propylthiouracil, methimazole)
2. Potassium iodine (saturated solution of iodine, SSKI)
3. Beta-blockade (propranolol, esmolol)
4. Corticosteroid (hydrocortisone)
5. Supportive care (fluids, acetaminophen)

Critical Actions

Administer steroids at the time of diagnosis. Steroids decrease T4 to T3 conversion in tissues and provide adrenal support, which can be impaired in thyroid storm.

When indicated, saturated solution of iodine should be given 1 hour after the first dose of anti-thyroid drug. Saturated solution of iodine is only indicated during the acute phase to rapidly block hormone release, and only after antithyroid drugs have been started. Once the patient is stabilized, definitive therapy (radioactive iodine, surgery, or continued antithyroid drugs) should be pursued, and SSKI should be discontinued.

Avoid aspirin because it displaces T4 from thyroid binding globulin, resulting in increase of FT4. Caution with the use of beta blockers in patients presenting with heart failure.

III. EVIDENCE

Evidence Appraisal

The BWPS was developed by Henry B. Burch, MD, and Leonard Wartofsky, MD, and first published in 1993.[1] It was derived from the authors' clinical observations from their patients at major referral centers (Walter Reed Army Medical Center and Washington Hospital Center), where they correlated clinical findings with patient outcomes (e.g., morbidity and mortality). They proposed a point-based diagnostic system aiming to provide a quantitative tool to differentiate uncomplicated thyrotoxicosis from impending or established thyroid storm.

There are no large-scale prospective validation studies due to the rarity of thyroid storm. Some retrospective cohort analyses and multicenter surveys have assessed its sensitivity, specificity, and correlation with outcomes like mortality and organ failure.

Angell et al. (2015) conducted a retrospective cohort study at a single U.S. tertiary center over 6-years period, age ≥ 18 years, TSH <0.01 mIU/L, comparing 47 patients with clinically diagnosed thyroid storm to 31 patients with compensated thyrotoxicosis.[4] They found that a BWPS score ≥45 had an outstanding sensitivity of 99% for detecting thyroid storm but a very low specificity of only 12%, meaning the score frequently over-diagnosed milder cases as storm. Patient with thyroid storm had greater in-patient mortality, hospital and intensive care unit length of stay, and ventilation requirements than patients who did not meet criteria for thyroid storm based on BWPS. The presence and severity of central nervous system dysfunction is the primary clinical feature distinguishing true thyroid storm from patients who do not have thyroid storm but score high on the BWPS. The study concluded that BWPS is a highly sensitive screening tool but should always be combined with clinical judgment due to its poor specificity.

Nagamine et al (2025) conducted another retrospective cohort study of 22 patients admitted to a single center from January 2012 until November 2024.[5] Patients were admitted with diagnosis of thyroid storm and severity scores obtained at presentation were evaluated for prognostic utility. Patients with poor outcomes (n=4; death or post–cardiopulmonary arrest resuscitation) demonstrated significantly higher APACHE II, SOFA, qSOFA, and BWPS values compared with those with favorable outcomes (n=18). Among the assessed tools, BWPS showed superior prognostic discrimination, with a cutoff of 95 achieving 100% sensitivity and 94% specificity on ROC analysis, highlighting its potential utility not only for diagnosis but also for early risk stratification in thyroid storm management.

Bourcier et al (2020) conducted a retrospective multicenter study in French ICUs for 31 centers for 92 patients admitted from 2010–2017.[6] BWPS applied retro-

spectively: Mean score 52 (range 25–85); ≥45 in 71% of cases aligned with clinical thyroid storm. BWPS correlated with organ failure scores (SOFA) and 28-day mortality (13%). This validates BWPS for ICU risk stratification but highlights overlap with sepsis mimics.

Additional criteria derived by Akamizu et al. (2016) from a retrospective nationwide survey of 354 Thyroid storm cases across 11,499 hospitals in Japan, also known as Japanese Thyroid Association (JTA) criteria, shows a high correlation with the BWPS.[7] Studies comparing the two systems show greater sensitivity of BWPS. In a cohort of 406 patients, the JTA criteria identified 354 cases of thyroid storm or impending storm, with 352 also identified by the BWPS, indicating high concordance.[8] However, the BWPS identified 41 additional patients, suggesting greater sensitivity. The JTA criteria may be more specific, requiring biochemical thyrotoxicosis and stricter symptom combinations.

The ATA guidelines note that BWPS is an empirically derived scoring system based on clinical features and precipitating events; the guidelines recommend it as part of a broader diagnostic approach, particularly in emergency settings, to facilitate prompt intervention and reduce mortality.[3] While acknowledging its high sensitivity for detecting potential cases, the ATA emphasizes that BWPS should be used in conjunction with clinical judgment and laboratory confirmation of thyrotoxicosis (e.g., elevated free T4/T3 and suppressed TSH), as it lacks formal prospective validation and may over-diagnose milder presentations.

Formula

The BWPS evaluates the following seven clinical domains:

Criteria	Points
Temperature, ºF (ºC)	
<99.0 (<37.2)	0
99.0-99.9 (37.2-37.7)	5
100.0-100.9 (37.8-38.3)	10
101.0-101.9 (38.4-38.8)	15
102.0-102.9 (38.9-39.4)	20
103.0-103.9 (39.5-39.9)	25
≥104.0 (≥40)	30
Heart Rate, bpm	
<90	0
90-109	5
110-119	10
120-129	15
130-139	20
≥140	25
Congestive Heart Failure	
Absent	0
Mild (pedal edema)	5
Moderate (bibasilar rales)	10
Severe (pulmonary edema)	15
Central nervous system disturbance	
Absent	0
Mild (agitation)	10
Moderate (delirium, psychosis, extreme lethargy)	20
Severe (seizure, coma)	30
Gastrointestinal-hepatic dysfunction	
Absent	0
Moderate (diarrhea, abdominal pain, nausea/vomiting)	10
Severe (unexplained jaundice)	20
Atrial fibrillation	
Absent	0
Present	10
Precipitating event	
Absent	0
Present	10

Facts & Figures

Add all the points for final score interpretation

Scores <25: Unlikely to represent thyroid storm

Scores 24–44: Suggestive of impending storm

Scores 45: Highly suggestive of thyroid storm

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