

# CHIARI CHECK

## A Machine Learning-Based Triage Tool for Canine Chiari Pain and Syringomyelia Using Owner-Reported Signs

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**Introduction:** Chiari-like malformation-associated pain (CM-P) and syringomyelia (SM) are neurological conditions commonly affecting brachycephalic toy breed dogs and crosses, requiring magnetic resonance imaging (MRI) for definitive diagnosis. However, access to advanced imaging is limited by cost and availability. The study aim was to develop an online questionnaire based diagnostic triage tool—Chiari Check (<https://caninechiari.com/>)—that estimates likelihood of CM-P and/or SM based on owner reported clinical signs. This tool is intended to support early decision-making and improve access to diagnosis for affected dogs worldwide.

**Methods:** Clinical data from 287 MRI-confirmed cases (diagnosed with Chiari-pain, syringomyelia, both, or neither) were used to train machine learning models. Data preprocessing and feature selection were applied, and several algorithms were evaluated, including Naïve Bayes, K-Nearest Neighbour, Support Vector Machine, and Decision Trees. Model performance was assessed using cross-validation accuracy.

**Results:** The weighted Naïve Bayes model achieved the highest predictive accuracy, particularly when trained on two different subsets—186 dogs for **Chiari-pain** with some values missing and imputed based on present values, and 144 dogs for **Syringomyelia** with no missing values. The final Chiari Check tool demonstrated strong potential to identify dogs at risk based solely on clinical signs reported by caregivers.



Chiari Check

July 2025 - Chiari Check database has **1,091 dogs** from 47 countries and 62 breeds / crosses (80% **Cavalier King Charles spaniels**)

Algorithm's ability to distinguish CM-P and SM is strengthened by recruiting **comparison groups**, including dogs with **osteoarthritis** (via the Canine Arthritis Management Facebook group) and with **allergic skin disease** (ongoing).

**Vocalisation** when **picked up** under the sternum was reported in 30.4% of database dogs with additional triggers including **changing position** (11.1%), **rising or jumping** (10.6%), and **defaecation** (2%). Caregivers also noted vocalisation during **scratching** at the neck/shoulder (10.4%) and ears (13.0%).

40.0% of the database had normal **exercise tolerance**, 27.1% showed initial enthusiasm but fatigued within 30–60 minutes, 14.0% refused exercise or fatigued within 30 minutes, and 18.9% had variable exercise tolerance.

Of the 767 dogs reported to **scratch**, the most common areas were the **ears and back of head** (67.3%), **towards neck and shoulders** (62.5%), and **face or mouth** (25.0%). Other areas included the **chest** (8.1%), **belly** (7.8%), and **tail base** (6.2%).

For dogs reported to have **scratching triggers** (n = 750), common examples were being **rubbed in a specific area** (33.9%), **emotional arousal** (30.1%), and **walking on a lead** (22.1%).

51.0% of the database dogs **played** daily or almost daily, 10.8% played daily but stopped quickly, 9.6% played 3–6 times a week, 9.6% played 1–3 times a week, and 20.0% rarely played or did not play at all

59.8% dogs of the database had uninterrupted sleep, 23.5% experienced occasional sleep disturbance, and 16.7% had frequent **sleep disturbance**.

**Conclusion:** Chiari Check is a novel, accessible diagnostic support tool that helps owners and veterinarians assess the likelihood of **Chiari pain** and **syringomyelia phantom scratching**, prioritising the need for MRI and enabling treatment decisions. The tool also serves as a valuable source of phenotypic data to advance research into these neurological conditions

