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The consecutive pattern poset is the infinite partially ordered set of all permutations where  $\sigma \leq \tau$  if  $\tau$  has a subsequence of adjacent entries in the same relative order as the entries of  $\sigma$ . A recursive expression for the Möbius function of this poset was given by Bernini–Ferrari–Steingrímsson and Sagan–Willenbring. Following up on their work, we study the structure of the intervals in this poset from topological, poset-theoretic, and enumerative perspectives. In particular, we prove that all intervals are rank-unimodal and strongly Sperner, and we characterize disconnected and shellable intervals. We also show that most intervals are not shellable and have Möbius function equal to zero. (Received August 03, 2016)