

Abstract Submitted
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Scaling behavior and a Markov model for ventricular fibrillation generated by ectopic beats¹ HAROLD HASTINGS, Hofstra University, STEVEN EVANS, ALEX ZAHARAKIS, CHRISTIAN HILAIRE — Sudden cardiac death is a major cause of death in the industrialized world, responsible for 300,000 deaths per year in the US. Although the cardiac electrical system normally produces one ventricular activation in response to each stimulus from the sinus node, “spontaneous” activations, called premature ventricular contractions (PVCs), can arise in the ventricles themselves, and propagate through the ventricles. Although usually harmless in the absence of underlying disease, PVCs can generate broken wavefronts when they meet gradients of refractoriness generated by other beats. These broken wavefronts may generate spiral waves producing ventricular tachycardia and ultimately degenerate into ventricular fibrillation (VF), causing sudden cardiac death. When does a PVC lead to ventricular fibrillation ? This is a stiff problem, involving time scales from milliseconds to many years. We overcome this problem by developing universal scaling properties and using these rules to drive a Markov process. We find two significant “amplifiers” and discuss consequences for variability of VF rates in human populations. We thank Elizabeth Cherry, Flavio Fenton, Anna Gelzer and James Glimm for helpful discussions.

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Harold Hastings
Hofstra University

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