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Page: 1/1

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Closed Loop Stimulation

BIOTRONIK strives to continuously challenge the status quo, and remains the industry's only provider of pacemakers, implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) devices with the [Closed Loop Stimulation](#) (CLS) rate-adaptive algorithm. Exercise, emotion and mental stress naturally cause the pulse to quicken in healthy patients. CLS is the only technology that mimics this feedback loop, adjusting cardiac device patient heart rates in response to emotional and psychological states.

How does CLS work?

When the heart is unable to increase its rate with physical exertion (chronotropic incompetence), it cannot pump enough blood to meet the body's needs. This can lead to syncope (fainting) or other issues.

To treat these conditions, CLS translates information about myocardial contractility (the strength of the heart muscle's contraction) into a pacing rate that the patient's own cardiovascular control system adjusts. CLS does this by monitoring and processing intracardiac impedance signals, correlated with the volume of blood in the heart's ventricles (pumping chambers).¹ Detectable changes in myocardial contractility are associated with the heart's response to exercise and acute mental stress.² By monitoring these changes, CLS continuously sets a pacing rate appropriate to the patient's physiologic demands at any given moment.²

Clinical Studies and Benefits

2017's SPAIN study, published in the *Journal of the American College of Cardiology*, found that CLS was associated with a sevenfold reduction of syncope cases in pacemaker patients.³ 2018's Rattanawong et al. meta-analysis of six studies, including SPAIN, found an 80 percent reduction in vasovagal syncope (VVS) cases in patients with CLS devices versus those receiving conventional pacing.⁴

References:

¹ Osswald S et al. *Pacing Clin Electrophysiol.* 2000, 23(10).

² Lindovská M et al. *Europace.* 2012, 14(11).

³ Baron-Esquivias G, Morillo CA, Moya-Mitjans A, et al. *J Am Coll Cardiol.* 2017;70(14).

⁴ Rattanawong MD et al. *Journal of Arrhythmia.* 2018, 34.